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VOLUME 19 NUMBER 5

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ARCHIVES OF OTOLARYNGOLOGY

VOLUME 19 MAY 1934 NUMBER 5

FUNCTION OF THE UTRICULO-ENDOLYMPHATIC VALVE

TWO CASES OF RUPTURED SACCULES IN CHILDREN

T. H. BAST, PH.D.

MADISON, WIS.

The function of the valvelike structure at the entrance of the utricular duct into the utricle has not been determined. The first account of it was given in 1928 by Bast,[1] who named it the "utriculo-endolymphatic valve" and made the following suggestion as to its possible function:

> Its position would indicate that the flow of endolymph is from the endolymphatic duct to the utricle, but this is not a necessary conclusion. If the flow is in the other direction the slow movement of the endolymph may not affect this valve. On the other hand, in case of sudden pressure disturbance, this valve may prevent the outflow of endolymph from the utricle thus maintaining a more constant pressure within the utricle and semicircular canals.

In 1929, Wilson and Anson[2] described the valve in a 2 year old child. In the same year Anson and Wilson[3] described it in an adult but designated it the "utricular fold." The following year Hoffman and Bast[4] described it as found in the monkey, cow, sheep, dog, pig, cat, rabbit, guinea-pig, gray squirrel, gopher and rat. They also attempted injections of pigmented fluids into the semicircular canals to determine the flow of endolymph in the region of the valve, but their results were not conclusive. Roberts,[5] in 1932, studied the valve in the ears of thirty rats. His description of the valve agrees with previous ones. As to function, he made the following statement: "Described here for the first time is the 'eminentia junctionis ductorum,'

From the Department of Anatomy, University of Wisconsin.

This study was prepared for the Research Council of the American Otological Society.

1. Bast, T. H.: The Utriculo-Endolymphatic Valve, Anat. Rec. **40**:61, 1928.
2. Wilson, John G., and Anson, Barry J.: The "Utriculo-Endolymphatic Valve" (Bast) in a Two-Year-Old Child, Anat. Rec. **43**:148, 1929.
3. Anson, Barry J., and Wilson, John G.: The Utricular Fold in the Adult Human Ear, Anat. Rec. **43**:251, 1929.
4. Hoffman, E. F., and Bast, T. H.: A Comparative Study of the "Utriculo-Endolymphatic Valve" in Some of the Common Mammals, Anat. Rec. **46**:333, 1930.
5. Roberts, Joe T.: On the Utriculo-Endolymphatic Valve in the Albino Rat, Anat. Rec. **53**:255, 1932.

a strong mound-like mass of tissue opposed to the cusp of the utriculo-endolymphatic valve. It strengthens the probability of a valvular function of the valve."

There are clinical cases on record, notably those of Kopetzky and Schwartz,[6] in which as a result of trauma the hearing was lost while the static labyrinthine findings were normal.

Numerous cases of congenital deafness in albino cats and some cases in dogs have been reported (Rawitz,[7] Alexander,[8] Alexander and Tandler,[9] Beyer,[10] Fraser[11] and Howe and Guild[12]) in which there was a collapse of the saccule and cochlear duct but normal distention of the utricle and semicircular canals. In these cases, however, the defect was developmental and may therefore not be pertinent to the problem under consideration.

MATERIAL AND OBSERVATIONS

During the past few months I have had the opportunity to study serial sections of two pairs of ears in which the cochlear duct and the saccule were collapsed owing to rupture of the saccule but the utricle and semicircular canals were normally distended. Unfortunately there is no clinical record of auditory findings in either of these cases.

CASE 1.—*History.*—The clinical history, furnished by Dr. C. D. Lehman, had no significance for the condition of the ears.

The body was embalmed in a dilute solution of formaldehyde by M. J. Lanham. The petrous bones were received by me on Dec. 5, 1932. They were fixed in picroformalin (0.5 per cent trinitrophenol in a dilute solution of formaldehyde, U. S. P. [12:100]) decalcified, embedded in successive changes of 5, 10, 15 and 20 per cent solution of Dupont parlodion and sectioned in series.

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6. Kopetzky, S. J., and Schwartz, A. A.: Total Deafness Due to Trauma with Normal Static Labyrinthine Findings: Report of Two Cases, Laryngoscope **33**:340, 1923.

7. Rawitz, B.: Gehörorgan und Gehirn eines weissen Hundes mit blauen Augen, Morphol. Arb. **6**:545, 1896.

8. Alexander, G.: Gehörorgan und Gehirn einer unvollkommen albinotischen, weissen Katze, Arch. f. Ohrenh. **50**:159, 1900.

9. Alexander, G., and Tandler, J.: Untersuchungen an kongenital tauben Hunden, Katzen und jungen kongenital tauber Katzen, Arch. f. Ohrenh. **66**:161, 1905.

10. Beyer, H.: Befunde an den Gehörorganen albinotischer Tiere, Arch. f. Ohrenh. **64**:273, 1905.

11. Fraser, J. S.: The Pathological and Clinical Aspect of Deaf-Mutism, J. Laryng. & Otol. **37**:13, 1922; Congenital Deafness in a Dog, ibid. **39**:92, 1924.

12. Howe, H. A., and Guild, S. R.: Absence of the Organ of Corti and Its Possible Relation to Electric Auditory Nerve Responses, Anat. Rec. (supp.) **55**: 20, 1933.

Histologic Examination.—The mucosa of the right middle ear was infiltrated with lymphocytes, and there was a little pus in the cavity. The right internal ear appeared normal.

The left middle ear was normal. The left internal ear had a collapsed cochlear duct and saccule (figs. 1, 2, 4 and 5), though the utricle showed only a slight loss of distention (fig. 1). A search of the serial sections revealed *two ruptures.* There was a small one in the utricle which measured about 60 microns (0.06 mm.). Figure 7 is a photomicrograph of part of the utricle wall, showing the greatest expanse of the rupture. Figure 8 is taken from a section 20 microns from the one shown in figure 7. It shows the healed margin of the rupture. In both of these figures marked regeneration of the epithelium can be seen. This new epithelium not only covered the margin of the break but extended onto the vestibular surface of the utricular wall. This rupture no doubt was of longer standing than the other and at the time of death was almost healed over, leaving only a small gap, not more than 60 microns in diameter.

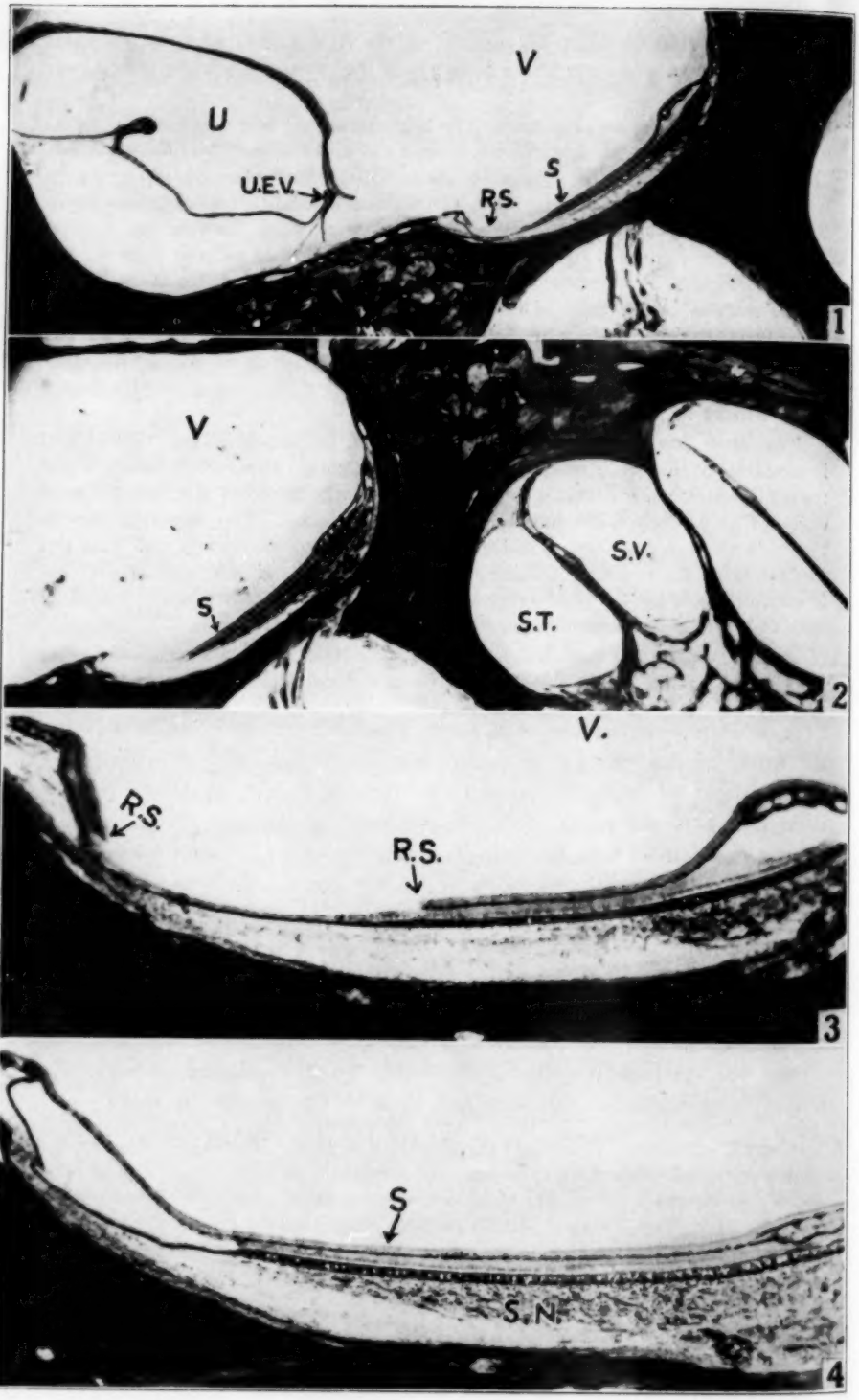
The other rupture, which was much larger, occurred in the saccule and involved about one sixth of the saccular circumference. In figure 3, which shows the collapsed saccule with the ruptured wall, it will be noted that the ruptured edges (*R. S.*) of the wall show no signs of regeneration. This indicates that the rupture was of recent standing and that regeneration had not taken place. That this rupture, with the resulting collapse of the saccule and cochlear duct, was recent is indicated also by the observation that the organ of Corti appeared normal in spite of the complete depression of Reissner's membrane (fig. 5).

An examination of the utriculo-endolymphatic duct showed that the utricular end of the duct was firmly closed by the utriculo-endolymphatic valve (fig. 6).

Comment.—From the histologic observations it is apparent that the utricular rupture was of longer standing than the saccular rupture. The extent of collapse caused by the utricular lesion cannot be determined. However, at the time of death the utricular distention was almost normal. It may be that there was utricular collapse which with the healing of the break was gradually corrected. The interesting observation, however, is that with the later break of the saccule the utricle did not collapse while the saccule and cochlear duct did. This indicates that the endolymph pressure in the utricle can be maintained independently of the pressure in the saccule and cochlear duct. It further indicates that the utriculo-endolymphatic valve which firmly closes the utriculo-endolymphatic duct (fig. 6) is responsible for maintaining utricular pressure and thus is functionally a valve.

Case 2.—*History.*—A child 14 months old died at the New York Nursery and Child's Hospital. The ears came into my possession through Drs. Marvin Jones and F. A. Hemsath. The clinical history was furnished me by Dr. Hemsath, but with the exception of several attacks of acute otitis media there was nothing that was pertinent to this problem.

Histologic Observations.—The sections of both ears showed marked lymphocytic infiltration of the mucosa of the middle ear and there was pus in the cavity of the middle ear. The internal ear was free from inflammatory processes.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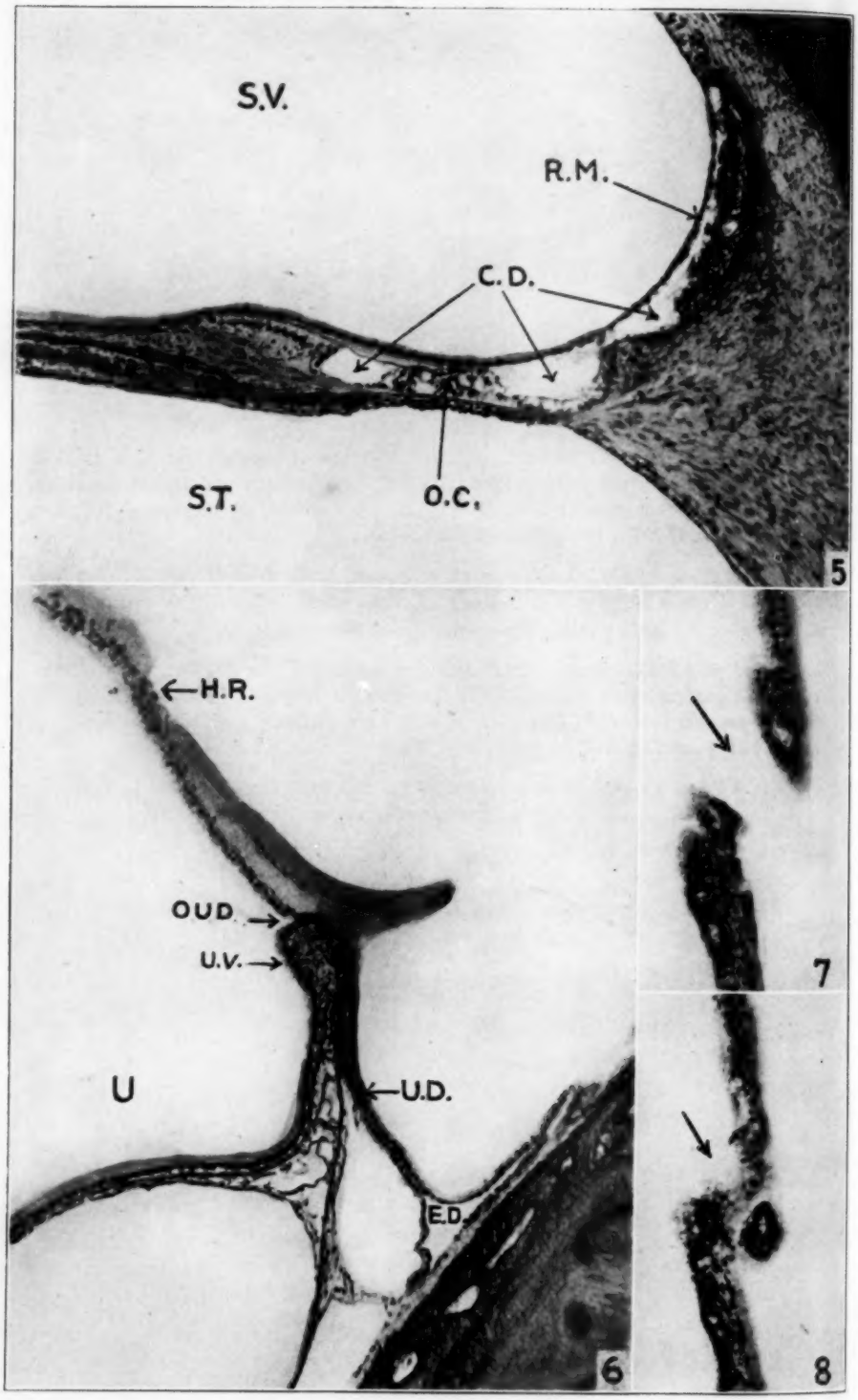
S
S.N.
4

Fig. 1 (case 1.)—Photomicrograph of a section of the left ear of a child 3 years old, showing the collapsed saccule and the distended utricle. A break in the saccular wall is seen at *R.S.* *U* indicates the utricle; *S*, the saccule; *V*, the vestibule, and *U.E.V.*, the utriculo-endolymphatic valve.

Fig. 2 (case 1).—Photomicrograph of a section of the left ear, showing the collapsed saccule and the collapsed cochlear duct. *V* indicates the vestibule; *S*, the saccule; *S.T.*, the scala tympani, and *S.V.*, the scala vestibuli.

Fig. 3 (case 1).—Photomicrograph of a section of the left ear, showing the collapsed and ruptured saccule. Note that there is no regeneration of the epithelium at the margins of the break. *V* indicates the vestibule, and *R.S.*, the ruptured edge of the saccular wall.

Fig. 4 (case 1).—An enlarged view of the collapsed saccule shown in figure 2. *S* indicates the saccule, and *S.N.*, the saccular nerve.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OUD.
U.V.
U
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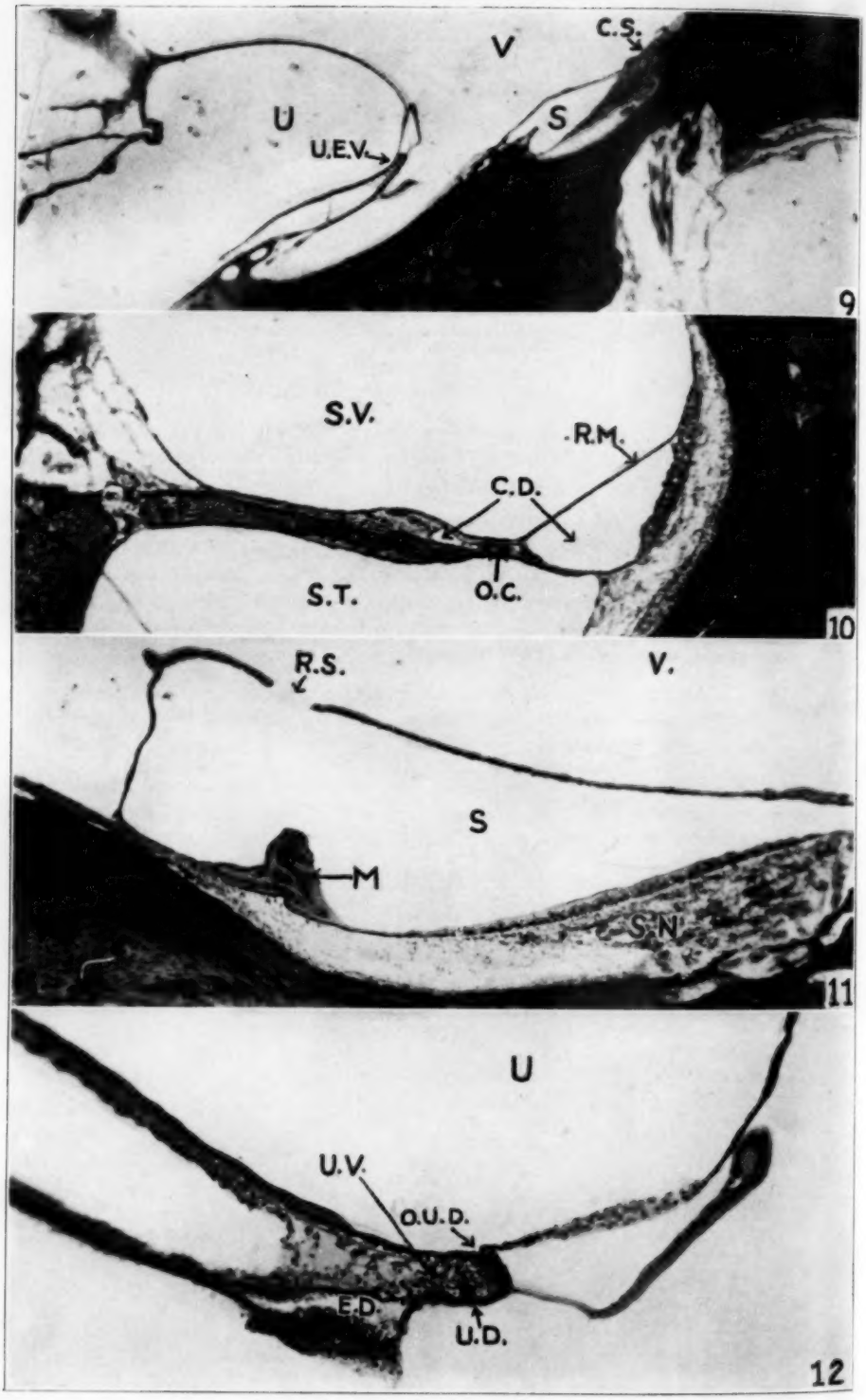
E.D.
6
7
8

Fig. 5 (case 1).—Photomicrograph of a section of the left ear, showing the collapsed cochlear duct (*C.D.*). *R.M.* indicates Reissner's membrane; *S.V.*, the scala vestibuli; *S.T.*, the scala tympani, and *O.C.*, the organ of Corti.

Fig. 6 (case 1).—Enlarged view of the region of the utriculo-endolymphatic valve shown in figure 1. *H.R.* indicates the healed margin of a rupture of the utricular wall. Figure 8 shows this rupture a few sections removed, and figure 7 shows the center of the rupture. *U.V.* indicates the utriculo-endolymphatic valve; *O.U.D.*, the opening of the utricular duct; *U.D.*, the utricular duct; *E.D.*, the endolymphatic duct, and *U*, the utricule.

Fig. 7 (case 1).—High power view of part of the utricular wall shown in figure 6. The arrow points to the rupture. Note the regeneration of epithelium over the edges of the rupture.

Fig. 8 (case 1).—High power view of the part of the utricular wall shown in figure 7 but two sections (20 microns) removed. The margins of the rupture, indicated by the arrow, are fused and covered by epithelium.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M
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U
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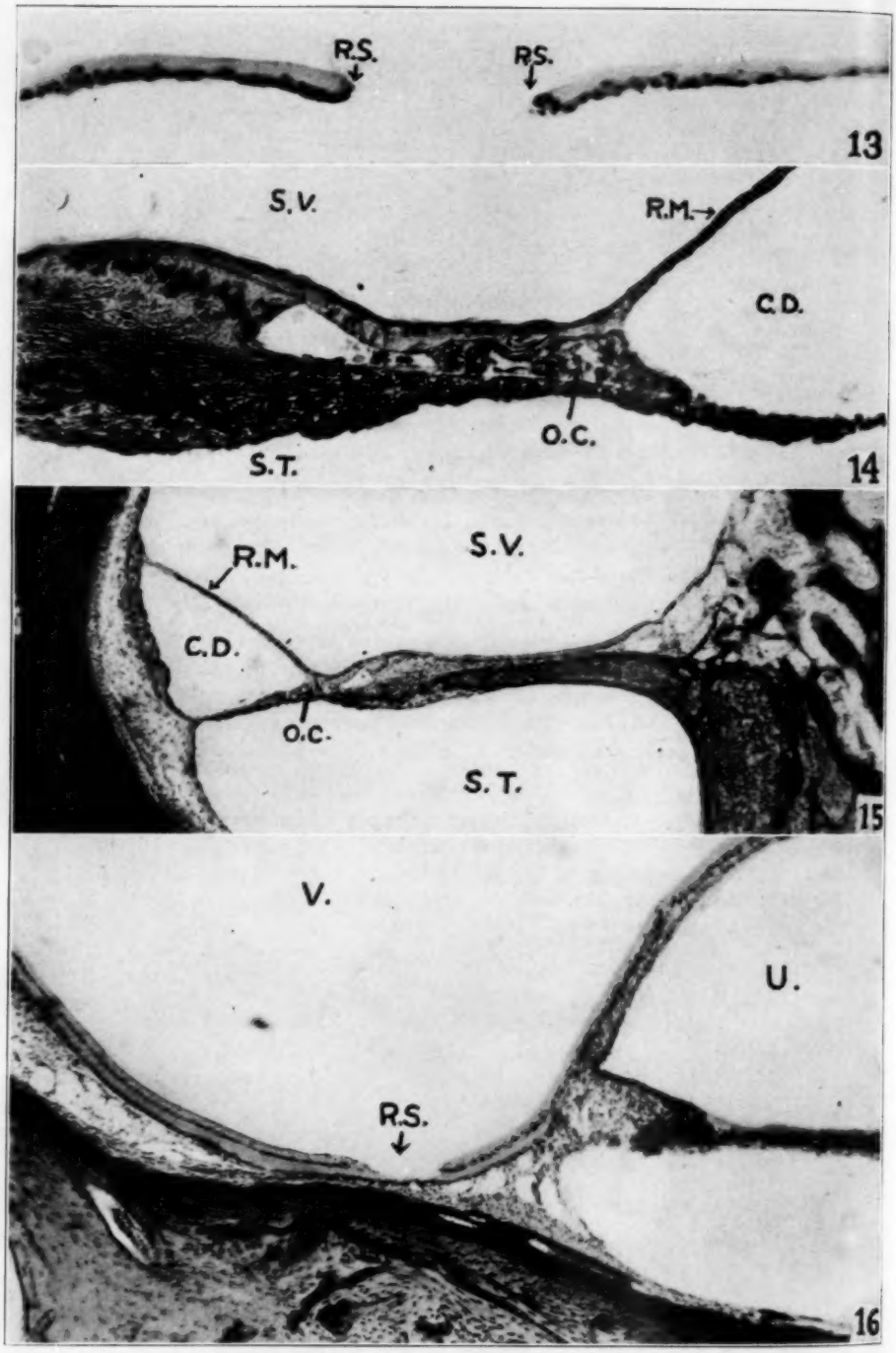
O.U.D.
E.D.
U.D.
12

Fig. 9 (case 2).—Photomicrograph of a section of the left ear of a 14 month old child, showing the partly collapsed saccule (*S*) and the normally distended utricle (*U*). *V* indicates the vestibule; *U.E.V.*, the utriculo-endolymphatic valve, and *C.S.*, the collapsed saccule.

Fig. 10 (case 2).—Photomicrograph of a section of the left ear, showing the cochlear duct (*C.D.*) partly collapsed and Reissner's membrane firmly adherent to the tectorial membrane and the organ of Corti (*O.C.*). *S.V.* indicates the scala vestibuli; *S.T.*, the scala tympani, and *R.M.*, Reissner's membrane.

Fig. 11 (case 2).—Photomicrograph of a section of the left ear, showing part of the saccule (*S*) with its wall ruptured at *R.S.* This picture shows the partly distended portion of the saccule, but part of the saccule to the right (not shown in the picture) was collapsed. There is a noncellular mass (probably mucoid) at *M*, on the wall opposite the rupture. *V* indicates the vestibule, and *S.N.*, the saccular nerve.

Fig. 12 (case 2).—An enlarged view of the region of the utriculo-endolymphatic valve shown in figure 9. *U* indicates the utricle; *U.V.*, the utriculo-endolymphatic valve; *O.U.D.*, the opening of the utricular duct; *U.D.*, the utricular duct, and *E.D.*, the endolymphatic duct.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O.C.
S.T.
15
V.
U.
R.S.
16

Fig. 13 (case 2).—Enlarged view of the saccular rupture shown in figure 11. Note the epithelial proliferation over the ruptured margin (*R.S.*).

Fig. 14 (case 2).—Enlarged view of the organ of Corti, with the adherent tectorial membrane and Reissner's membrane shown in figure 10. *S.V.* indicates the scala vestibuli; *S.T.*, the scala tympani; *O.C.*, the organ of Corti; *R.M.*, Reissner's membrane, and *C.D.*, the cochlear duct.

Fig. 15 (case 2).—Photomicrograph of a section through the right ear, showing the cochlear duct (*C.D.*) partly collapsed and Reissner's membrane (*R.M.*) firmly adherent to the tectorial membrane and the organ of Corti (*O.C.*). Note that the cochlea is much the same as that in the left ear (fig. 10). *S.V.* indicates the scala vestibuli, and *S.T.*, the scala tympani.

Fig. 16 (case 2).—Photomicrograph of a section through the right ear, showing the collapsed and ruptured saccule (*R.S.*) and the distended utricle (*U*). *V* indicates the vestibule.

However, in both ears the saccule was collapsed, while the utricle was normally distended. The cochlear duct was partly collapsed, with Reissner's membrane firmly adherent to the tectorial membrane and the organ of Corti. The cochlear duct between the organ of Corti and the stria vascularis was distended, so that Reissner's membrane was stretched between the organ of Corti and its normal attachment on the spiral ligament (figs. 10 and 15). The attachment of Reissner's membrane to the organ of Corti indicates that the collapse was not recent and that complete collapse must have existed for some time. The distention of the cochlear duct in the region of the external spiral sulcus must be interpreted as the result of new endolymph formations, but the adhesion of Reissner's membrane to the organ of Corti prevented the distention to normal capacity.

As in case 1, the collapse was traced to a rupture in the saccule. The condition in the two saccules in this case, however, was not the same.

Right Ear: The saccule was completely collapsed, and the two walls seemed to be cemented together. The rupture occurred in the region of the junction of the endolymphatic duct to the saccule. The rupture was much smaller than that in case 1. In spite of the fact that the collapse appeared to be of considerable duration there was no proliferation of the epithelium at the margin of the break (fig. 16). The complete collapse with apparent cementing of the two walls of the saccule made the cochlear duct a closed cavity and no doubt accounted for the partial distention of the cochlear duct with the production of new endolymph. The lower part of the utricle was fully distended as shown in figure 16. Unfortunately the middle region of the utricle was poorly embedded, and some tearing and displacement of the tissues occurred during sectioning.

Left Ear: Fortunately the left ear was well preserved, and the sections were intact. The condition of the saccule was somewhat different from that in the right ear. The lower medial portion, in the region where the ductus reuniens enters, was completely collapsed, and the walls seemed glued together (*C.S.*, fig. 9), but the rest of the saccule was partly distended (*S*, figs. 9 and 11). The rupture in the saccular wall, seen at *R.S.* in figure 11, was small, and epithelium had grown over the margins of the break (*R.S.*, figs. 11 and 13). In this saccule there was an acellular mass (*M*, fig. 11) of mucus-like material in which there were finely granular areas which stained blue with hematoxylin and resembled calcium deposits. No such masses were noted in the right saccule or in the saccules in case 1. The condition of the cochlear duct (fig. 10) was much the same as in the right ear. The utricle, shown in figure 9, was normally distended, and its wall was everywhere intact. The utriculo-endolymphatic valve (figs. 9 and 12) was pressed firmly against the saccular wall so that the utricular duct was closed.

COMMENT

If the interpretation of case 1 is questionable in the face of the fact that there was a small almost healed defect in the utricular wall, the normally distended utricle with an intact wall in case 2 seems to show beyond doubt that the utriculo-endolymphatic valve is capable of maintaining an approximately constant pressure within the utricule and semicircular canals when a sudden reduction of pressure occurs in the rest of the endolymphatic system.

It is to be regretted that the results of clinical auditory tests were not available in these cases, as it would be extremely interesting to see

whether the clinical findings agreed with the histologic observations, which indicate that the auditory apparatus was out of commission while the vestibular mechanism was intact. That such conditions occur is shown by the cases reported by Kopetzky and Schwartz, but unfortunately no histologic studies were made. Among the cases of congenital deafness in cats the one reported by Howe and Guild was carefully studied, and the clinical and histologic observations agreed. However, the deafness and the collapse and deformity of the saccule and cochlear duct in the case of the cat were due to developmental defects and thus would not throw any light on the function of the utriculo-endolymphatic valve unless it could be shown that the saccule and cochlear duct were normal at some time during the period of development.

The case reported by Fraser, that of a 13 year old boy who was considered deaf-mute but who had a little hearing in the right ear, agrees well with my case 2. The left ear in Fraser's case had a collapsed saccule and a partly collapsed cochlear duct with Reissner's membrane attached to the organ of Corti, but the utricle was normally distended. Fraser, however, did not report the presence of a rupture in the saccule, which was found in both of my cases. Other similar cases, but with only partial collapse of the cochlear duct, were reported by Steurer,[13] but no reference was made to an accompanying rupture of the saccule, nor was any clinical history given.

Brühl [14] reported a number of cases of an abnormal histologic picture in the internal ear of patients whose hearing he considered normal. In two cases there was partial collapse of the cochlear duct. In one case the right ear showed a condition similar to that in my case 2, but he did not study the other ear. In the first two cases mentioned hearing tests were made three and one-half and five weeks previous to death and were reported as normal. He felt that if these patients had become hard of hearing between the time of the tests and death they would have noticed it. This, however, is open to question as his patients were inmates of an institution for persons with mental disease. He suggested that there was a possibility that the histologic picture was due to postmortem change, but he questioned this suggestion. He made no mention of damage or collapse in the saccule.

That the abnormal condition of the cochlea and saccule in the two cases which I have reported was not due to postmortem change is

13. Steurer, O.: Die atrophischen, dystrophischen und degenerativen Erkrankungen des inneren Ohres, in Henke, F., and Lubarsch, O.: Handbuch der speziellen pathologischen Anatomie und Histologie, Berlin, Julius Springer, 1925, vol. 12.

14. Brühl, Gustav: Histologische Labyrinthbefunde bei Normalhörenden, Beitr. z. Anat., Physiol., Path. u. Therap. d. Ohres **5**:438, 1912.

shown by the fact that the ruptures were partly healed and that in one case Reissner's membrane was fibrosed to the organ of Corti.

So far as I can find, no saccular ruptures were reported in any of the cases in which the cochlear condition was similar to that in my two cases. It should be remembered that such a saccular rupture can easily be overlooked unless serial sections through the entire internal ear are carefully studied. This is especially true when the rupture is small.

SUMMARY

These two cases show that the auditory division (cochlear duct and saccule) of the endolymphatic system may be disturbed to the extent of collapse without damage or collapse of the vestibular division (utricle and semicircular canals). These cases further indicate that the "utriculo-endolymphatic valve" is responsible for the maintenance of apparently normal pressure in the utricle and semicircular canals when the pressure in the saccule and cochlear duct is suddenly reduced.

MYOBLASTOMA OF THE LARYNX

REPORT OF A CASE

LOUIS KLEINFELD, M.D.
NEW YORK

Myoblastomas are tumors which may occur anywhere in the body in relation to striated muscle. They are composed of myoblasts, the ancestral cells of striated muscle. Although commonly considered rare, over fifty cases have been described since the first report seven years ago by Abrikossoff.[1] Only two of the cases were reported in the English literature, until Klemperer [2] recently wrote an article adding six cases, of which the case reported here is one.

These tumors are composed of two types of cells: a polygonal cell with granular cytoplasm (resembling xanthoma cells) and a ribbon-like syncytial mass (resembling early embryonal muscle fiber). Some of these tumors, especially those involving the vocal cords, often show hyperplasia of the overlying epithelium, thus simulating carcinoma, from which they can be differentiated by the scarcity of mitoses or atypical cells. The tumors differ from xanthoma, microscopically, by the absence of fat, as shown by failure to stain with sudan. They are probably due to abnormal histogenetic development, possibly following trauma, rather than to degeneration of preexisting striated muscle fiber. These growths have been found in persons of any age, but mostly in middle-aged men. (A form of myoblastoma is found in the new-born, so-called congenital epulis.) The tumors have a predilection for the upper respiratory and digestive tracts, in which location over three fourths of those reported have been found.

Clinically, they are benign. Only one of the reported cases became malignant. (In this one, there were numerous mitoses and atypical cells.) All the other tumors, when completely excised, failed to recur under observation.

REPORT OF CASE

C. R., a white man, aged 50, was seen by me in 1931, with the complaint of hoarseness for the past two years, associated at times with attacks of dyspnea and syncope. Examination of the larynx revealed a white, somewhat nodular mass, about 1 cm. in diameter, at the junction of the middle and anterior thirds of the left vocal cord. There were no palpable cervical glands. General physical examination gave negative results, though a roentgenogram of the chest showed moderate

1. Abrikossoff, A.: Virchows Arch. f. path. Anat. **260**:215, 1926.
2. Klemperer: Am. J. Cancer **20**:324 (Feb.) 1934.

emphysema. The blood, sugar and urine were normal. A roentgenogram of the larynx was negative. With the patient under local anesthesia, the tumor was removed in three fragments by indirect laryngoscopy. There was no reaction following this procedure. The patient has been examined by me several times in the past three years. When he was last seen, a month before this report was written, the vocal cord was normal. Incidentally, I operated on him a year ago, to remove a fibroma of the hard palate.

The pathologic diagnosis was somewhat in doubt for a while. Consequently, the sections were sent to three prominent New York pathologists who submitted diagnoses, respectively, of epidermoid carcinoma, xanthoma and tumor of neural origin.

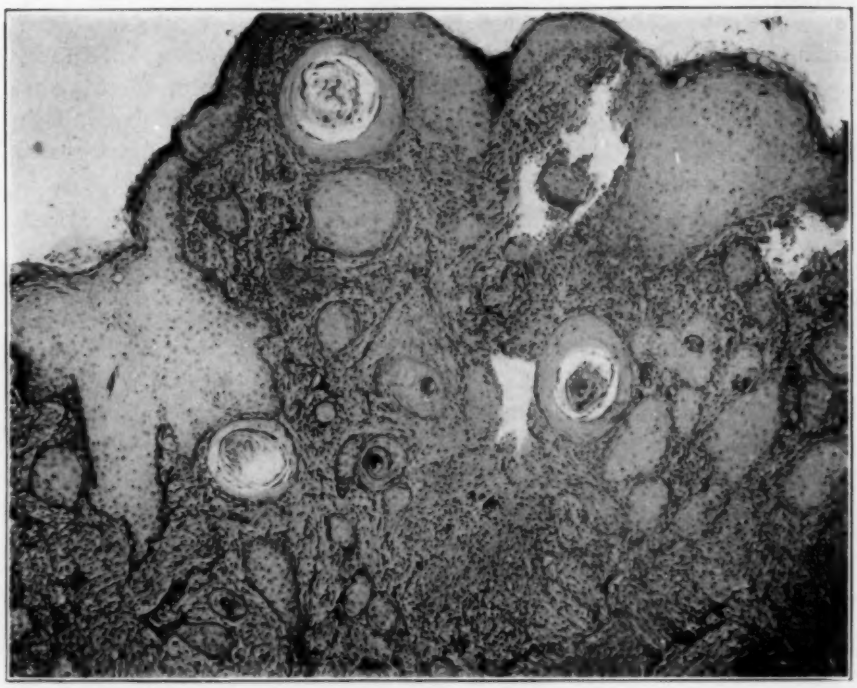

Fig. 1.—Section of the tumor. Note the tumor cells at the bottom of the picture.

Finally, Dr. Klemperer, pathologist to Mount Sinai Hospital, was able to make a definite diagnosis of myoblastoma, based on the following: "Microscopic examination showed a neoplasm within the submucosa extending up to the surface epithelium. The tumor was not sharply defined from the surrounding loose connective tissue of the submucosa. It consisted of polygonal cells averaging from 17 to 21 microns in diameter, plus multinucleated ribbons averaging 14 microns in breadth and of varying lengths. The nuclei were round, occasionally angular, averaged from 6 to 7 microns in diameter and contained varying amounts of chromatin and, frequently, nucleoli. The cytoplasm was coarsely granular and faintly basophilic. The granules were generally crowded, but here and there they were loosely arranged, causing the cells to stand out because of their lighter color, thus suggesting xanthoma. However, sudan staining revealed no fat. Individual cells and

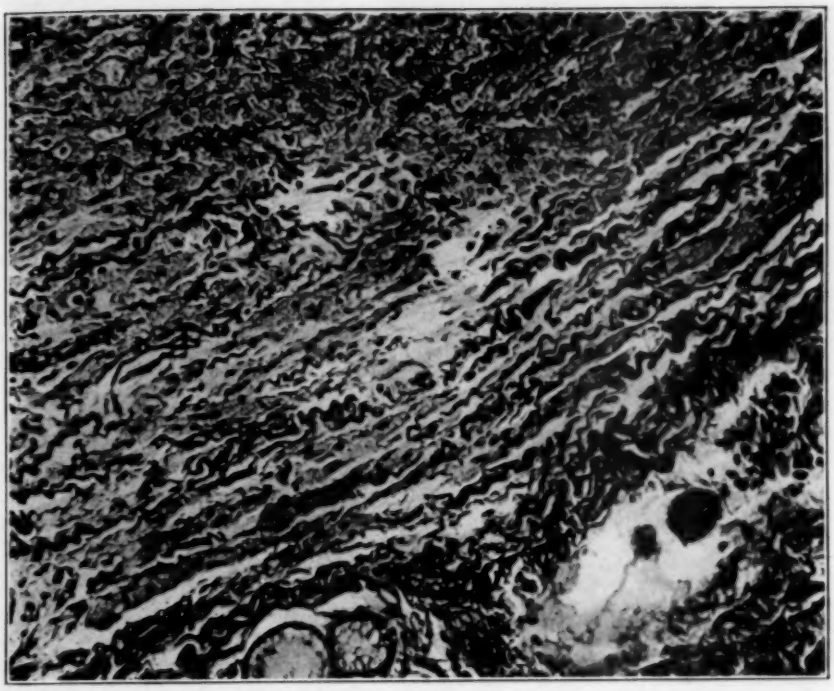

Fig. 2.—Section of the tumor. Note particularly the bands of cells.

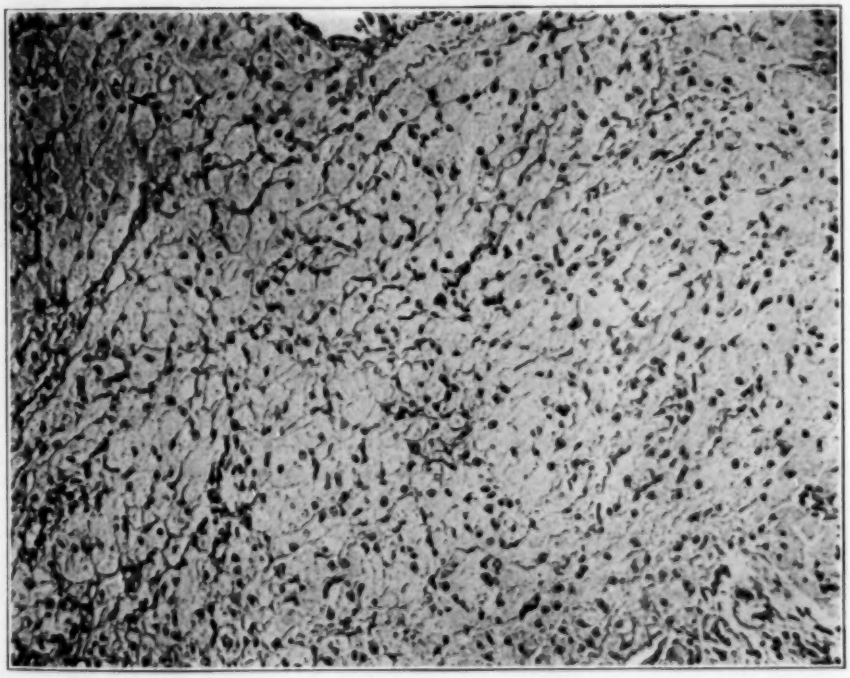

Fig. 3.—Section of the tumor. Notice the cells which resemble xanthoma but which did not stain with sudan.

bands were surrounded by slender connective tissue fibers which clung to the cells. Broad septums of coarser collagen fibers delimited larger and smaller islands of neoplastic tissue. These bands carried the larger blood vessels. A fragment from the surface showed the tumor cells directly beneath the superficial squamous epithelium, which they compressed. In other areas, epithelial pegs and islands dipped deeply into the underlying stroma. Some of the nests showed distinct pearl formation, but the squamous cells were regular throughout and showed only sporadic mitoses.

The reports of other cases of laryngeal myoblastoma which previously appeared in the literature were by Abrikossoff,[3] Dawydow[4] and

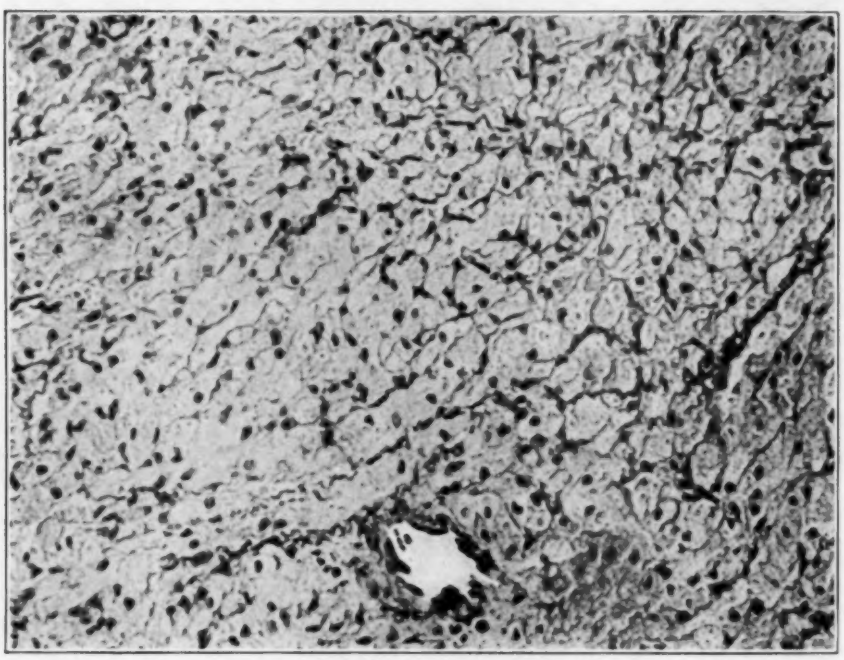

Fig. 4.—Higher power magnification of figure 3.

Derman and Golbert.[5] The tumor in Abrikossoff's case occurred on the right vocal cord of a man, and resembled the early stages of a squamous cell carcinoma because of its early atypical proliferation. In Dawydow's case, the tumor was a pea-shaped mass on the right vocal cord of a 30 year old man. The epithelial proliferation suggested an incipient carcinoma. The tumor reported by Derman and Golbert was likewise found on the right vocal cord of a 30 year old man, and again

3. Abrikossoff, A.: Virchows Arch. f. path. Anat. **280**:723, 1931.

4. Dawydow, I.: Ztschr. f. Hals-, Nasen- u. Ohrenh. **30**:220 (Dec. 18) 1931.

5. Derman, G. L., and Golbert, Z. W.: Virchows Arch. f. path. Anat. **282**: 172, 1931.

the epithelial proliferation suggested incipient carcinoma. Although this mass was only incompletely removed, there was no recurrence when the patient was seen in eight months.

The two reports on this subject in the English literature are made by Dewey [6] and Keynes.[7] Moschcowitz [8] reported a case of xanthoma which was probably a myoblastoma. Imperatori [9] reported a case of rhabdomyoma of the larynx which closely resembles myoblastoma.

CONCLUSION

1. Myoblastoma of the larynx is a benign tumor which closely simulates not only another benign tumor, xanthoma, but also epidermoid carcinoma. Consequently, this tumor must be kept in mind when a diagnosis is being made from microscopic examination of laryngeal growths.

2. Although this is only the fourth case of myoblastoma of the larynx to be reported, I am sure that more will be found if the possibility is kept in mind.

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6. Dewey, K. W.: Rhabdomyoma of the Tongue, Arch. Path. **3**:645 (April) 1927.

7. Keynes, G.: Brit. J. Surg. **13**:570, 1926.

8. Moschcowitz, Eli: Proc. New York Path. Soc. **22**:135, 1922.

9. Imperatori, C. J.: Laryngoscope **43**:945 (Nov.) 1933.

ANATOMY AND PATHOLOGY OF THE PETROUS BONE

BASED ON A STUDY OF FIFTY TEMPORAL BONES

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Within the last few years considerable interest has been aroused concerning certain anatomic and pathologic characteristics of the petrous bone. Among those who have been active in this work should be mentioned: Druss, Friesner, Kopetzky, Almour, Eagleton, Frenkner, Profant, Glick, McMahon, Boemer, Lillie, Lawson and others. Restudy of the anatomy of the petrous bone has thrown much light on the pathologic possibilities.

ANATOMY

In the present investigation twenty-five temporal bones were studied from microscopic sections and twenty-five were examined from gross sections. The bones were studied to determine the variations in the distribution of the bone marrow and the pneumatic spaces. Of the twenty-five bones of which gross sections were made, seven, or 28 per cent, showed pneumatic spaces in the petrous apex. In four of the seven these were paratubal cells. Of the twenty-five bones of which microscopic sections were made, ten, or 40 per cent, had pneumatic spaces in the petrous apex. In nine of the ten these were paratubal (fig. 1). Taking the total group of fifty petrous bones, there were seventeen, or 34 per cent, with pneumatic spaces in the apex. In the gross study of bone 25, right, the large cell at the apex was found to be 13 mm. long, 8 mm. wide and 5 mm. high at its anterior end. In both bones 25, right, and 25, left, pneumatic spaces extended above and below the labyrinth from the antrum region to the apex (fig. 2).

Pneumatic spaces were frequently found about the canals and vestibule, although not extending to the petrous apex. Of the twenty-five bones studied grossly, four, and of the twenty-five examined microscopically, eleven, showed this condition, making a total of fifteen bones, or 30 per cent of the whole group, having pneumatic spaces about the canals and vestibule. Dividing the total number of fifty bones in

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From the Department of Otolaryngology, Rush Medical College.

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another way, it was found that in twenty-two, or 44 per cent, the pneumatization was limited posteriorly to the region about the antrum, whereas in twenty-eight, or 56 per cent, there were various degrees of pneumatization farther forward in the petrosa (figs. 3, 4 and 5).

Marrow was found in the petrous apex in forty-seven, or 94 per cent, of the bones. It is possible that it was overlooked in the three

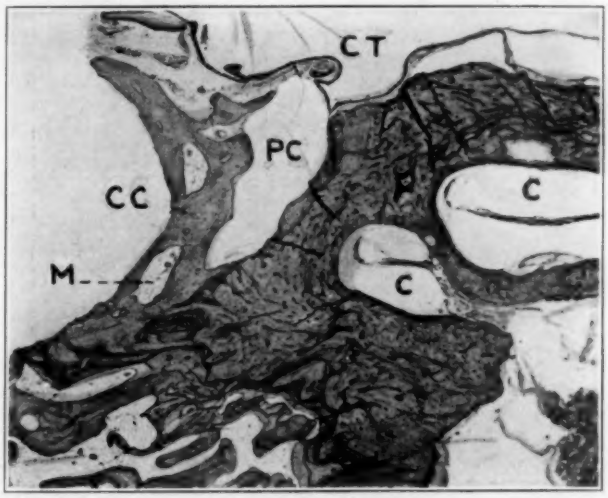

Fig. 1.—Section showing paratubal cells, *PC*, and marrow spaces, *M*, between the cochlea, *C*, and the bony wall of the internal carotid artery, *CC*. *CT* is the cavum tympani; × 9.

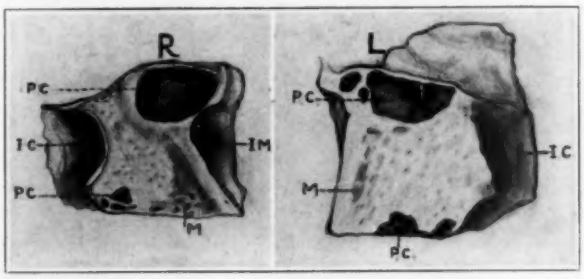

Fig. 2.—Anterior end of bones 25, right, and 25, left, demonstrating large pneumatic cells. *PC* indicates the pneumatic cells; *M*, marrow; *IC*, the internal carotid canal, and *IM*, the internal auditory meatus.

in which it was listed as not found, because of incomplete examination. Marrow seems constant in this region. Marrow spaces were also noted along the posterior border of the petrosa behind the internal auditory meatus in nine bones, or 18 per cent of the total group. A small amount of marrow was found in a few instances in other parts of the sections,

such as in the bone lateral to the cavum tympani. The main types of marrow found were the red and fatty and a combination of the two. No record was kept as to which type predominated in the various locations, although apparently the fatty marrow predominated in

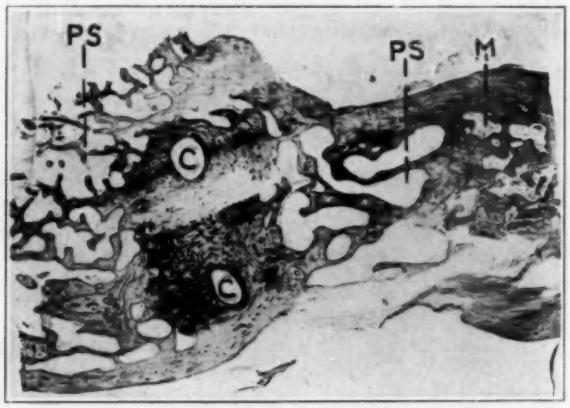

Fig. 3.—Section showing pneumatic spaces, *PS*, extending anteriorly beyond the crura of the superior semicircular canal, *C*. *M* indicates marrow in the anterior portion of the bone; × 3.5.

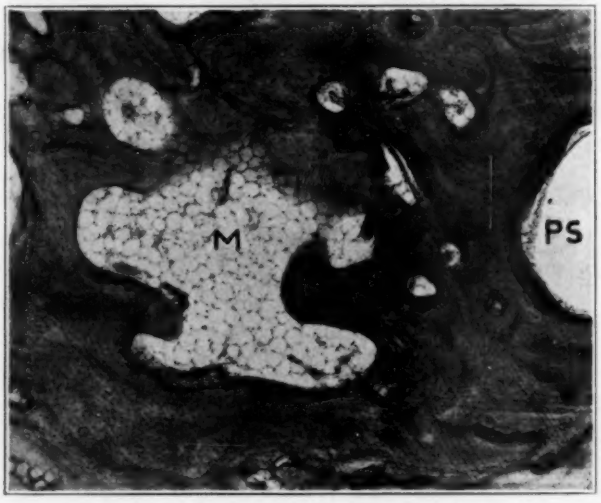

Fig. 4.—High power magnification of figure 3, in which marrow, *M*, and pneumatic spaces, *PS*, are adjacent; × 27.5.

quantity, especially in the petrous apex. It was evident that marrow alone could exist in the petrous apex, but that when pneumatic spaces were present there, marrow also was found. Examination of the carotid wall showed dehiscences in several instances. In one bone there

appeared to be a connection between the periosteal connective tissue lining the bony carotid wall, through the wall and into a marrow space. As to the relationship between the right and left bone in the same patient, the anatomic picture may be similar, or it may vary. The distance between the basal part of the cochlea and the carotid artery varied from less than 1 to 4 mm., being from 1 to 3 mm. in most of the bones. This distance increased, however, just below the tegmen tympani at the level of the canal for the tensor tympani and the tympanic opening of the eustachian tube, because the cochlea had receded at this higher level and the carotid canal had coursed forward. Here the distance between the cochlea and the carotid canal varied from about 4 to 10 mm., giving an average of 6.2 mm.

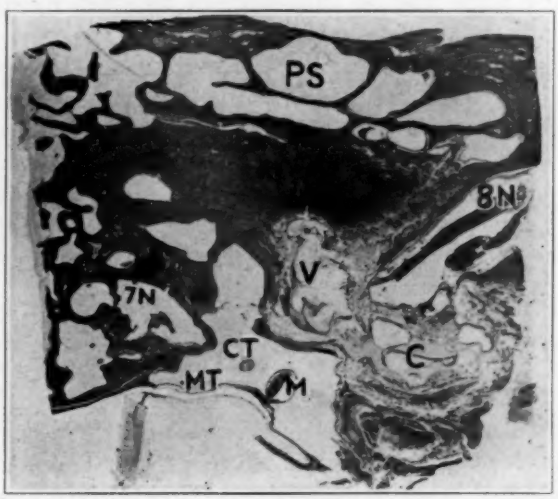

Fig. 5.—Section showing extensive pneumatization along the posterior wall of the petrous bone. *PS* indicates a pneumatic space; *V*, the vestibule; *C*, the cochlea; *8N*, the eighth nerve; *7N*, the seventh nerve; *CT*, the cavum tympani; *M*, the malleus, and *MT*, the membrana tympani; × 3.5.

Comment.—These observations bring out certain interesting anatomic and practical points and further support statements made in the literature. There seems to be no reason why a given bone may not present any one of a number of anatomic variations. Thus, one petrous bone may have pneumatic spaces in the antrum region only; another may have spaces about the vestibule and canals as well, and a third may, in addition, have spaces in the petrous tip. The pneumatic spaces may vary in size from those that are small to those that give the petrosa a cellular appearance. It would seem obvious that there would be no one procedure capable of handling infections of all petrous bones. In some, drainage from antral cells would be sufficient. In others, drainage

would have to be maintained forward to the internal auditory meatus along the posterior border of the petrous bone. In others, with fistulous tracts already established, drainage would need to be established for the cells extending to the petrous apex above or below, or both above and below, the labyrinth. When cells invade the petrous tip, but either no easy connection or none at all exists to the antrum region, the tip would be drained by way of the middle ear at the site chosen by Almour and Kopetzky. When pneumatic cells do not exist in the petrous apex, the infection would involve the marrow, leading to osteomyelitis. In this event the petrosal sinus would be drained by the method of Eagleton. In some cases, of course, both osteitis and osteomyelitis would exist.

It is evident that correct treatment of infections involving the petrous bone depends a great deal on knowledge of the anatomy of the given petrosa. At present, careful study of the history, symptoms, roentgenograms and operative findings is the best that can be done. Great progress has been made and is being made in roentgen diagnosis. It is a question whether it will ever be possible in certain instances to diagnose preoperatively or ante mortem the type of petrosa which a given case presents and consequently to predict the pathologic findings. Even granted that the pathologic changes are known, it may be either difficult or impossible to provide adequate drainage for extensive or peculiarly localized types of infection.

PATHOLOGY

The pathologic report consists of the study of six temporal bones from five patients. Two patients, MD (right and left ear) and CO (right ear) died of causes other than infection of the ear. The other three patients, Mrs. T (right ear), FE (left ear) and JA (left ear) died of intracranial infection associated with aural infection.

CASE 1.—MD, a woman, aged 49, had terminal infectious splenitis, hemolytic anemia and agranulocytosis. The condition began one year previous with dyspnea, weakness, swelling of the arms and legs and headache. At the time of onset the left ear began to discharge; this was followed by discharge from the right ear. While the patient was in Billings Hospital both ears were found to be discharging. No evidence of mastoid infection was recorded. General postmortem examination revealed: profound hemolytic anemia, marked hyperplasia and engorgement of the spleen, icterus levis, marked hyperplasia and hyperemia of the bone marrow, especially that of the femur, slight edema of the extremities, hydrothorax, atelectasis and bronchopneumonia. Smears of the bone marrow showed many staphylococci. Cultures of the spleen, bone marrow and blood showed hemolytic Staphylococcus albus. Examination of the marrow revealed an absence of polymorphonuclears, with marked hyperplasia of the hematogenous cells, which had largely replaced the adipose elements.

Bone 1, Right Ear.—Gross Examination: The mastoid cells were numerous but small, while the antrum was of normal dimensions. Examination showed the

mucous membrane to be much thickened; it was 3 mm. thick at one place. No fluid pus was seen. The drum membrane appeared to be intact, although it was very thin near the umbo.

Microscopic Examination: Many pneumatic cells were seen in the horizontal sections at the upper levels. These spaces extended around the lateral and medial crus of the superior semicircular canal, and the former was continuous with the cells in the lateral bony wall of the cavum tympani (fig. 6). At the level of the labyrinth the cells filled most of the petrous bone behind the vestibule and surrounded the facial canal. This condition continued to the lowermost sections, where it was evident that pneumatization did not extend anteriorly under the labyrinth. No cells were found in the petrous apex. The interesting feature in these sections was that all the pneumatic cells were infected, thus revealing extensive infection of the petrous bone. In view of the history, this was not looked for. The middle

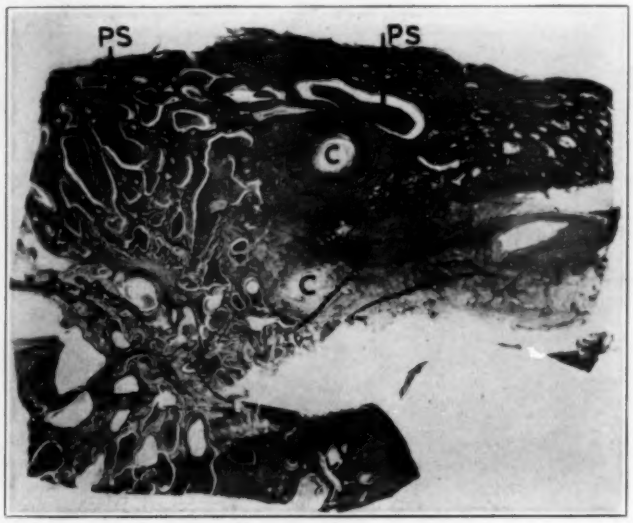

Fig. 6.—Section of the right temporal bone of patient MD (case 1), showing extensive infection of pneumatic spaces, *PS*, at the level of the superior semicircular canal, *C*. The clinical diagnosis was chronic otitis media; × 3.5.

ear and antrum did show infection, as was to be expected. A pyogenic membrane was noted lining the antrum and tympanic cavity. The ossicles were also surrounded by infection, with several pockets of pus adjacent to them. Infected subepithelial tissue was seen extending into the marrow of the incus. The stapes was scarcely recognizable because of the extensive infection about it. The general pathologic picture, both in the pneumatic spaces and in the middle ear, consisted of considerable thickening of the tunica propria and accumulation in the free spaces of a pinkish-staining serum, containing from a few to many cells (more macrophages than polymorphonuclears). The entodermal epithelium was surprisingly well preserved in places. The tunica propria varied from a delicate vascularized connective tissue mesh to a rather dense tissue containing numerous cells (connective tissue cells, fibroblasts, macrophages and plasma cells). This subepithelial tissue appeared in certain instances to extend into adjacent haversian and Volkmann's canals. Marrow spaces were noted anterior to the cochlea, and other small ones

were seen along the posterior border of the petrous bone. No evidence of infection was observed in the marrow, except in the spaces along the posterior border, adjoining the infected pneumatic spaces. No infection was observed in the labyrinth or in the bone immediately about it.

Bone 2, Left Ear.—Gross Examination: A large antrum was found; the mastoid cells were not noted. Some thickening of the mucous membrane in the antrum was present. Examination of the drum membrane showed a 2 mm. perforation near the umbo.

Microscopic Examination: As in the right ear, pneumatic spaces extended anteriorly past the crura of the superior canal, reaching to the marrow spaces in the tip. At lower levels the cells were more confined to the region behind the vestibule and canals, although pneumatic spaces extended along the posterior border of the petrous bone as far as the cochlea. They also surrounded the ductus endolymphaticus. Cells were present lateral to the region of the petrosal nerve and

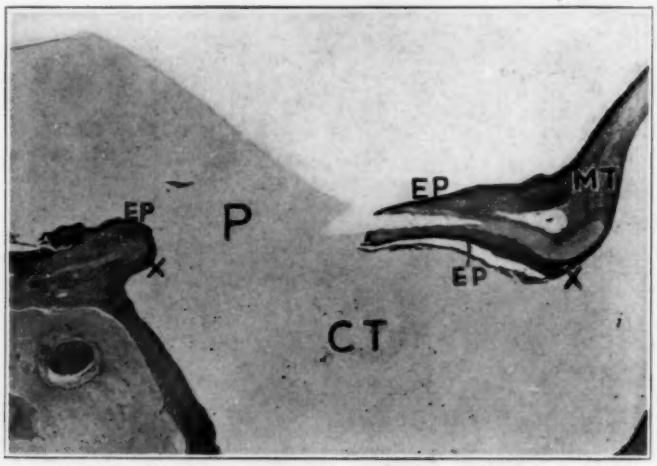

Fig. 7.—Section of the left temporal bone of patient MD (case 1), showing perforation, *P*, with epidermis, *EP*, extending around the "corner" onto the inner surface of the membrana tympani, *MT*, and also extending toward the cavum tympani, *CT*. *X* represents the junction of the epidermis with the mucous membrane; × 11.

in the bone of the lateral wall of the cavum tympani and antrum. All these pneumatic spaces were infected as in the right ear. Here, again, the history did not give any idea as to the extent of the infection. As was to be expected, the mucous membrane of the cavum tympani was infected, and the ossicles were surrounded by a pyogenic membrane. Infiltration of cells into the joint capsule between the malleus and the incus and into that between the incus and stapes was noted. The infected subepithelial tissue extended into the marrow cavity of the incus. The stapes was hardly recognizable because of the extensive infection in and about it. The joint of the fenestra ovalis, however, was uninfected. The fenestra ovalis was also intact, although considerable infected tissue lay up against it. The entodermal epithelium was well preserved in places, as on the right side. Marrow spaces were observed anterior to the cochlea, there being no pneumatic spaces here. The membrana tympani was infiltrated by cells, especially in the region

posterior to the lateral process. At the site of the perforation the epidermis was observed to line both sides of the membrane (fig. 7). From the other margin of the perforation it extended a short distance into the cavum tympani. No cholesteatoma formation was present, however. Just below the perforation, epidermis was still observed lining both sides of the drum membrane (fig. 8). The junction of the epidermis and the entodermal epithelium was distinct and fairly abrupt. The lowermost sections did not reveal any infected pneumatic spaces extending below the labyrinth. However, those previously mentioned were still present. At no place was the labyrinth altered. The relatively few polymorphonuclears found in the sections would correspond with the history of agranulocytosis (1,200 white blood cells, with 8 per cent polymorphonuclears). The marrow did not seem to be altered, as was found in the femur.

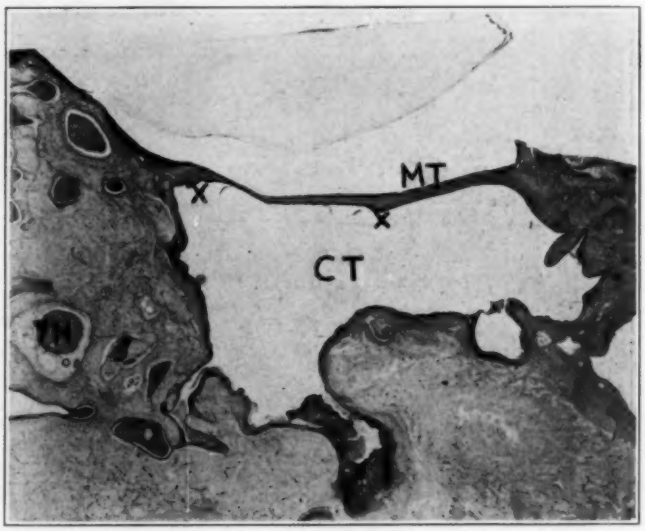

Fig. 8.—Section of the same bone as in figure 7, showing epidermis lining both sides of the membrana tympani, *MT*, just below the perforation. *X* marks the junction of the epidermis with the mucous membrane of the cavum tympani, *CT*. *7N* indicates the seventh nerve; × 7.

Comment: The patient gave a history of bilateral simple chronic otitis media. Death occurred from other causes than aural infection; yet both petrous bones were found to be extensively involved.

Case 2.—*Bone 3, Right Ear.*—CO, a man, aged 53 years, complained of poor vision and pains in the eyes. A diagnosis of bilateral optic neuritis was made. All the teeth, including several abscessed ones, were removed as a probable source of the infection. However, the patient did not recover; he became gradually weaker, and, in spite of a search for other foci, died at Billings Hospital several months after first applying for treatment. Examination of the ears some weeks previous to death revealed bilateral partial deafness of the inner ear. Bilateral eczema of the external canals was also found. Nineteen days before death, spontaneous perforation of the right drum membrane occurred, and the ear discharged profusely (Streptococcus haemolyticus and Staphylococcus aureus) until the end. No mas-

toid symptoms were recorded. The clinical diagnosis was: chronic hypertension, cardiac hypertrophy, renal arteriosclerosis, renal insufficiency, chronic uremia, pericarditis and right suppurative otitis media. Multiple chronic peptic ulcers of the stomach were also found post mortem; the pia-arachnoid of the brain was thickened, and the amount of spinal fluid was increased.

Gross Examination: The drum membrane and the ossicles could not be recognized, and the medial wall of the cavum tympani and antrum contained considerable unrecognizable discolored tissue. No other unusual features were noted.

Microscopic Examination: Horizontal sections at the level of the superior canal showed a definitely pyogenic membrane lining the antrum region. All the pneumatic spaces in the subadjacent petrous bone up to the region of the canal were infected. The entodermal epithelium was destroyed in some of the spaces; in others it was present, with a thickened subepithelial layer. All sections to

Fig. 9.—Section of the temporal bone of patient CO (case 2), showing channel, *CH*, through the bone, connecting infection in the cavum tympani, *CT*, with a haversian canal, *H*, and from here connecting with infected subepithelial tissue, *S.EP*, of a pneumatic space; × 64.5.

below the level of the labyrinth showed these changes. In several sections the subepithelial tissue was followed from the pneumatic space into adjacent haversian and Volkmann's canals. In one instance the subepithelial tissue was directly connected with a marrow space. In another instance a channel connected the infected tissue of the cavum tympani with a haversian canal, and from here there was a similar connection to the infected tunica propria of a pneumatic space (fig. 9). Such extensive involvement of the petrous bone (fig. 10) with a clinical history of only acute suppurative otitis media of nineteen days' duration is a revelation. Infection was expected in the cavum tympani, but not in the petrous bone. The membrana tympani was infiltrated by cells, and a layer of pus covered part of its surface. It was injured at autopsy, so that the perforation could not be demonstrated. The manubrium of the malleus contained infection in its marrow spaces. The incus was mostly surrounded by pus, and infected subepithelial tissue extended

into a large marrow space in the ossicle (fig. 11). Granulation tissue and pus infiltrated and surrounded the stapes, so that it was scarcely recognizable. The foot plate and joint were intact, except when dislocated at autopsy. The tensor

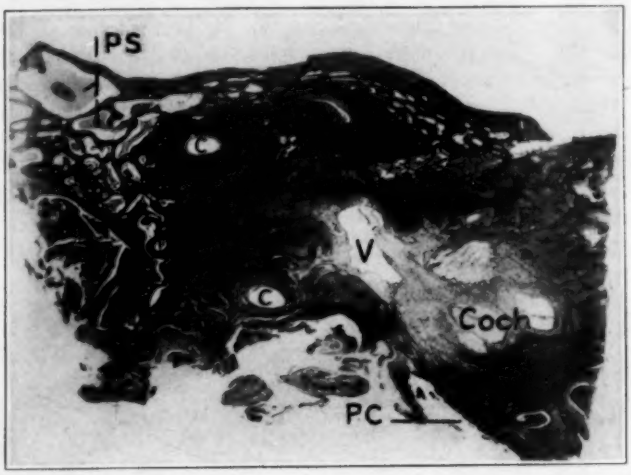

Fig. 10.—Section of the same bone as in figure 9, showing intensive infection of pneumatic spaces, *PS*, of the petrous bone. *C* indicates a semicircular canal; *V*, the vestibule; *Coch*, the cochlea, and *PC*, an infected paratubal cell. The clinical diagnosis was acute suppurative otitis media; × 3.5.

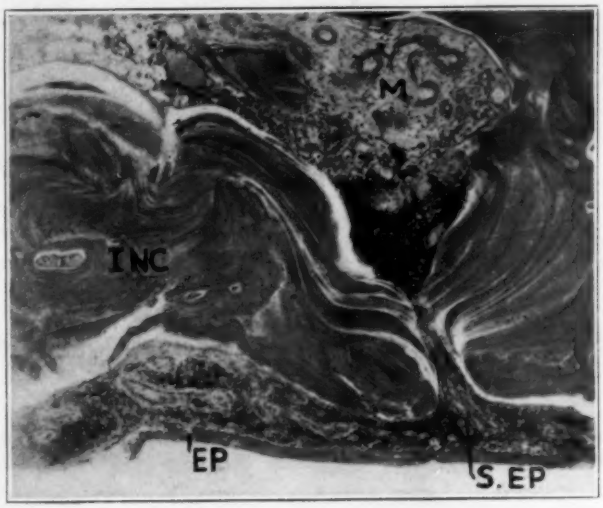

Fig. 11.—Section of the same bone as in figures 9 and 10, showing infected subepithelial tissue, *S.EP*, extending into a marrow space, *M*, of the incus, *INC*. *EP* is the epithelium around the incus; × 63.5.

tympani muscle, the stapedius tendon and the seventh nerve at its genu were more or less surrounded by pus. The pyogenic membrane noted in the antrum region

also covered the medial wall of the tympanic cavity, the epithelium having been totally destroyed, except in the region of the eustachian tube. A moderate-sized infected paratubal cell and a large marrow space lay side by side between the cochlea and the region of the gasserian ganglion. Infected subepithelial tissue extended into the marrow space and also to the nerve tissue of the ganglion region (fig. 12). The labyrinth was intact and free from infection. Complete degeneration of the organ of Corti was observed from its beginning in the vestibule and for about one half of the basal coil. This corresponded to the clinical finding of deafness of the inner ear and was also found in sections of the opposite ear. The deafness was present long before the otitis media and had no relationship to it. Marrow spaces were present at the petrous tip, and some were also seen along the posterior border of the bone. Infected subepithelial tissue from a pneumatic space extended into one of these.

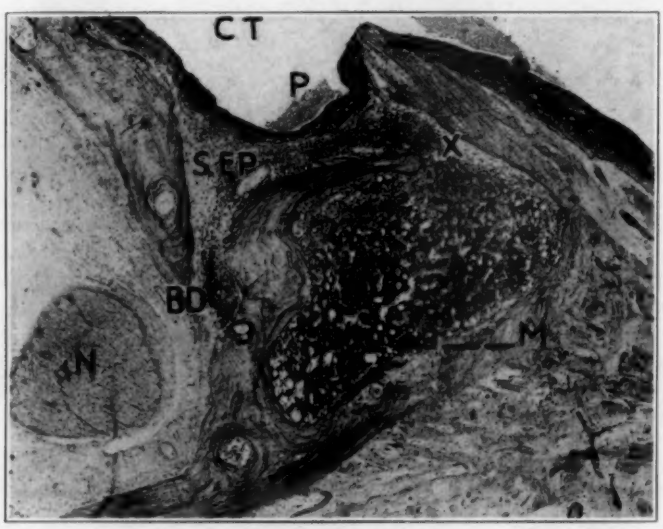

Fig. 12.—Section of same bone as in figures 9, 10 and 11, showing infected subepithelial tissue, *S.EP*, extending from the cavum tympani, *CT*, into a narrow space, *M*, at the point *X* and also through a bony dehiscence, *BD*, to the nerve tissue, *N*. *P* indicates pus in the cavum tympani; × 13.5.

Comment: The patient died nineteen days after the onset of ordinary acute suppurative otitis media (spontaneous perforation). Death was due to other causes, yet the petrous bone was extensively infected.

Case 3.—*Bone 4, Right Ear.*—The suppurative features of the right temporal bone of Mrs. T., aged 37, have previously been reported.[1] Right otitis media developed following pharyngitis. After about five days mastoidectomy was performed, at which time a mastoid devoid of blood and containing little pus was found. The sinus was freely exposed; it was slightly bulging and whitish and was not incised. Examination of the pus showed Str. haemolyticus. Following this operation, intracranial symptoms developed, and eleven days later a second

1. Hagens, E. W.: Acute Suppuration of Temporal Bone; Report of Case, Arch. Otolaryngol. **10**:21 (July) 1929.

operation was carried out, at which time incision of the dura of the middle fossa led into a fistula, from which about 30 cc. of nonfetid pus (Str. haemolyticus) and an equal amount of clear fluid were discharged. The sinus bled from both ends. The patient's condition remained poor, and a third operation was undertaken. An abscess in the brain was drained. The patient became worse and died shortly. Autopsy revealed a subdural abscess, an obturating and adhering thrombosis in the sigmoid and inferior petrosal sinuses, diffuse encephalitis and an abscess of the right temporal lobe in communication with the inferior and posterior horn. The

Fig. 13.—Section of the temporal bone of Mrs. T. (case 3), showing infection of pneumatic spaces. *A* indicates pus lying free in the pneumatic spaces, and *C*, epithelium raised up from the bone as a result of the development of a thick subepithelial layer of connective tissue, *B*; × 17.

plexus choroidus of the ventricle on the left side was dilated and filled with pus, and a general fleck like that of spotted meningitis was present.

Gross Examination: This showed thrombosis of the sigmoid and inferior petrosal sinuses. The antrum and middle ear appeared filled with firm blackish tissue. Only the head of the malleus and the body of the incus could be recognized. The drum membrane was not found. The dura overlying the posterior edge of the bone was thickened to ¼ inch (0.6 cm.) and was black. The carotid artery and canal appeared intact, although several cell-like areas were seen in the bony wall.

Microscopic Examination: From the first there was considerable evidence of infection. However, it was limited to the rear portion of the petrous bone, back of the vestibule and canals. The pneumatic spaces were practically filled with pus. In places the epithelial mucous membrane lining the spaces had been pushed into the lumen for a considerable distance by the enormous thickening of the tunica propria. The latter was vascular and contained numerous lymphocytes and some plasma cells and phagocytes. The epithelium was columnar in some places, flattened or cuboidal in others. In a number of cells it was absent; here free blood and pus practically filled the spaces and were in contact with the bare bone (fig. 13). The infected tunica propria apparently extended to the subjacent haversian and Volkmann's canals. New bone, underneath a layer of osteoblasts, was noted lining certain of the pneumatic spaces. Considerable purulent material was seen in the region of the eustachian tube and in the tympanic attic and the cavum tympani. The malleus and incus were present, but were surrounded in part by pus and the joint was absent. While the epithelium was well preserved in the anterior part of the tympanic cavity, it had been entirely destroyed in the posterior part. Infected tissue extended into the marrow spaces of the ossicles. Infected subepithelial tissue had passed through the bony carotid wall down to the artery. The stapes was invaded and surrounded by connective tissue, pus and blood cells. However, the joint region was intact. At the fenestra rotunda a prolongation of subepithelial tissue from the cavum tympani extended inward, replacing the secondary tympanic membrane and being in contact with the perilymph of the vestibule. Epidermis from the external canal grew into the cavum tympani and extended a considerable distance over the mass of infected material filling most of the tympanic cavity. The labyrinth was not infected. There were a few marrow spaces in the petrous apex, but no pneumatic cells.

Comment: The patient died of otitic intracranial complications. The onset of these was unusually rapid. Infection did not extend anteriorly through the petrous bone.

Case 4.—*Bone 5, Left Ear.*—FE, a young woman, aged 20, had had slight deafness in the left ear following scarlet fever at the age of 5 years. Since that time there had been also an intermittent discharge with a foul odor. There was no history of pain or headache during these years. Ten days before death, acute otitis media developed on the left side. Nausea occurred, with headache and slight vertigo, but no nystagmus. Examination of the hearing was difficult because of the extreme prostration of the patient. At the hospital the nausea, vomiting and vertigo subsided for two days; then the headache on the left side began again, and projectile vomiting occurred. At the first operation (Dr. D. B. Hayden) a large cholesteatomatous mass was found in the cavum tympani. A radical mastoid operation was performed, and the dura was elevated to the internal auditory meatus. Incision into the cerebellum gave negative results. Following the operation the patient's condition was fairly good, but there was still slight vomiting, and ataxia of the left hand was noted. A second operation was performed, and exploration of the cerebellum again gave negative results. The patient gradually became worse, until death supervened. Autopsy revealed thrombosis of the left lateral sinus and a deep-seated cerebellar abscess.

Gross Examination: The left temporal bone showed absence of most of the external auditory canal and membrana tympani. What was left of this region was partly filled with necrotic material. The mastoid and antrum region had been removed at operation, and the remaining tissue was covered with a necrotic layer. The wall of the sigmoid sinus appeared infected, and the bulb of the jugular vein

was filled with a thrombus. At the bend of the internal carotid artery the bone appeared necrosed, and the wall of the artery, including the intima, was infected, although no clot was found.

Microscopic Examination: At the superior levels relatively few pneumatic spaces were noted in the posterior part of the bone. These contained organized tissue, but no free pus. The bone was solid anterior to the superior semicircular canal. A number of small marrow spaces were present in the tip. Slightly lower sections revealed an organized blood clot and pyogenic membrane in the antrum region. Underneath this were small pneumatic spaces filled with organized material. A number of the spaces were lined with osteoblasts, underneath which was

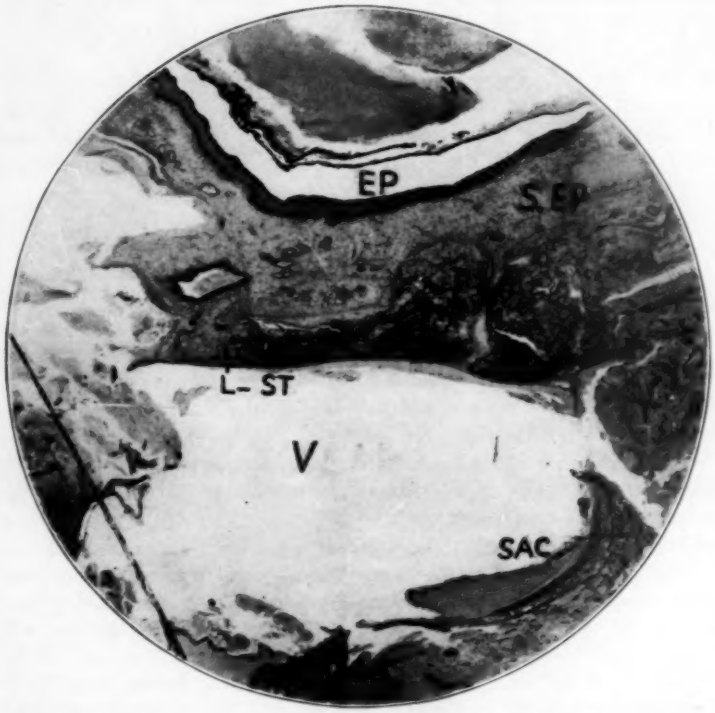

Fig. 14.—Section of the temporal bone of patient FE (case 4), showing epidermis, *EP*, grown into the tympanic cavity and overlying infected subepithelial tissue, *S.EP*, and the stapes, *ST*, which has been practically replaced by an otosclerotic process. *V* indicates the vestibule; *SAC*, the saccule, and *L*, part of interrupted line to the stapes; × 17.

newly formed bone. The malleus, incus and drum membrane were absent. The stapes was in most part replaced by otosclerosis and was buried in an organized mass of infected tissue, over which epidermis from the outer ear had extended (fig. 14). The stapedial joint was not infected. The second tympanic membrane was intact but thickened and was in contact with infected tissue. The labyrinth was not invaded. The tunica propria of the eustachian tube was considerably thickened, and the lumen contained an exudate with a moderate number of white blood cells. As the tube gained entrance to the tympanic cavity, it appeared to lead

into the infected subepithelial tissue covered by the epidermis and to end blindly there. Some pus was seen in the carotid canal (bony). At one point it appeared to have gained access to the canal from a paratubal cell. This would explain the source of the gross pathologic changes in the carotid artery itself.

Comment: This case presented acute otitis media engrafted on old suppurative otitis. Death occurred from intracranial complications. The anterior parts of the petrosal bone were not invaded.

CASE 5.—*Bone 6, Left Ear.*—JA, a man, aged 64, gave a history of otitis media on the left side of five weeks' duration. The upper posterior wall of the external canal was found to be sagging, and there was deep tenderness on pressure over the mastoid, although no edema of the mastoid was noted. Hearing was poor on the left side (Dr. G. E. Shambaugh). The tuning forks showed the Weber test lateralized to the left side, the small *c* 4 fork being heard fairly well. No vertigo was noticed. The patient was operated on for simple mastoid infection. All went well for several days until meningeal symptoms developed. On the sixth day the patient became suddenly worse, having chills with fever. A second operation revealed nothing pathologic, the lateral sinus bleeding freely on nicking. Postmortem examination showed meningitis as the cause of death.

Gross Examination: In the left temporal bone the posterior surface of the petrous bone presented an unusual picture. There was a large pathologic rounded elevation, apparently covered with bone, extending fully ½ inch (1.27 cm.) backward from the internal auditory meatus. The swelling included a considerable portion of the posterior surface of the bone. It was found that a small needle could be sunk into this tissue without any resistance. Just posterior to the swollen region was an area of erosion approximately ⅜ inch (0.9 cm.) in diameter, which extended to the superior margin and half way to the lower margin. The needle also penetrated this area easily. No pathologic changes were noted in the region of the slit for the saccus endolymphaticus. No landmarks could be made out in the cavum tympani, only dark discolored tissue being seen. The mastoid and antrum had been cut away.

Microscopic Examination: The sections were cut vertically in the coronal plane. The posterior part of the bone showed many small and moderate-sized pneumatic spaces. Considerably thickened subepithelial tissue filled in much of the lumen of the spaces. An exudate was seen in some of the cells, but with only a moderate number of white cells and no great number of polymorphonuclears. In the antrum region the infection was intense; there was an appearance of heavy granulation tissue, and the epithelium was absent. The tissue extended into the underlying pneumatic spaces, and from here there appeared to be a connection with the adjacent haversion and Volkmann's canals. This picture of infection was noted in all the sections anteriorly until the region of the posterior semicircular canal was reached. Here normal bone was encountered about the canal, and the sections continued to show normal bone as the labyrinth was cut through, so that from here to the tip the labyrinth and the bone about it were uninfected. The area of erosion seen on gross inspection was plainly evident in sections cut in the region of the canals. Here was dense granulation tissue containing many red and white cells, extending ⅛ inch (0.3 cm.) inward and including small areas of bare bone, A thin layer of normal bone protected the ductus endolymphaticus. Superiorly, the area was continuous, with infected cells extending across the superior surface of the petrous bone above the level of the canals. At one region, just anterior to the eminentia arcuata, there was absence of bone, with the formation of a large cavity filled with granulation tissue. The infected pneumatic cells of the superior

surface were continuous with infected pneumatic spaces on the lateral, or middle ear, side of the bone. The latter side showed the same type of infection as the antrum region. Entodermal epithelium was present only in places. A number of sections showed infected spaces extending from the middle ear side across, below the labyrinth, to the posterior surface of the bone. The prominent elevation noted on the posterior surface of the bone on gross examination was easily seen to consist of a thin shell of bone with a large cavity beneath, which was mostly filled with pus and granulation tissue. The shell of bone was deficient at several points, especially at the lower end. This cavity was in direct communication with the cavity of the superior surface. Evidences of bony repair were seen in the osteoblasts lining the edges of the bony spicules still present around the borders of the abscess.

The stapes was not observed, infected tissue filling in the fossa to the region of the fenestra ovalis. No definite footplate could be identified, the only positive observation being that the infection had not spread into the vestibule. The membrana tympani secundaria was intact, but granulation tissue was attached to its tympanic surface, and considerable exudate and infected tissue filled the fossa. Sections cut through the internal auditory meatus and cochlea revealed the bone of the posterior petrosal wall, which still showed a large abscess cavity about the meatus (above and below). This was continuous with the infection underneath the cochlea, and the latter joined the pyogenic membrane covering the promontory region. Infected pneumatic spaces were also present above the cochlea, so that there was practically a continuous ring of infection around the cochlea. This ring of infection persisted at the apex of the bone, just anterior to the cochlea, although it was not so extensive, especially superiorly, where considerable normal bone with marrow was seen.

Comment: In this case fatal intracranial complications followed acute infection of the middle ear and mastoid. The petrous bone was extensively infected, with perforation of the posterior and superior surfaces. Evidently, successful surgical intervention would have been impossible.

GENERAL COMMENT

A study of the series of petrous bones just described brings out certain points of interest. It is apparent from the bones of MD (case 1, right and left ears) that the petrosa may be extensively involved in a patient suffering from an ordinary simple chronic otitis media. This infection is likely to occur when pneumatic spaces have extended through the bone. One wonders how many such cases have existed without being diagnosed. It is difficult to say how dangerous such an infection may be, and it is not comforting to know that the infection may be so extensive and also so close to the brain and meninges. In case 2 (CO, right ear) examination showed that even in ordinary acute suppurative otitis media the petrosa, if pneumatized, may be extensively infected. Yet one does not ordinarily think of such an invasion when treating so-called simple otitis media. The care of patients with acute and chronic otitis media will be continued as in the past, yet it should be borne in mind that in certain cases extensive infection of the petrosa may be present. To be forewarned is to be forearmed. The cases just

mentioned did not present mastoiditis clinically; hence no diagnosis of mastoid infection was made, and the mastoids were not operated on. In cases in which mastoiditis has been diagnosed clinically and operation has been performed there is naturally a chance for drainage of the infected petrosa in some instances, even though it is not recognized.

Of the three patients who died of otitic intracranial complications, one, JA (case 5, left ear), showed extensive invasion of the petrous bone. In the other two patients the infection was limited to the rear portion of the petrosa. Comparison of these bones show that in the case of JA the bone was extensively pneumatized, while in the other two cases it was not.

Study of all six bones leads one to conclude that infections usually spread by way of pneumatic spaces. To a lesser extent, the infection extends from the infected subepithelial tissue of the pneumatic spaces into the haversian and Volkmann's canals and into the marrow cavities. In severe infections, total destruction of all the tissue, including bone tissue, may occur. It would seem that the pneumatic spaces are more easily infected than the haversian and Volkmann's canals and the marrow spaces. Intracranial complication may occur, as in the bones of FE (case 4) and Mrs. T (case 3), from extension from the antral region, or as in the bone of JA (case 5), in association with perforation of an infected petrosa. The inner ear, or labyrinth, seems well protected by the compact bone about it. The fenestra ovalis with the stapedial foot plate resists infection remarkably well. The fenestra rotunda also is resistant, although in the bone of Mrs. T (case 3) a fistula developed into the perilymphatic space. In both the cavum tympani and the pneumatic spaces extensive changes of the subepithelial tissue, as compared with the entodermal epithelium, were noticed. The lining of the cavum tympani with epidermis, as in the bone of FE (case 4), illustrates how, even though there is epidermatization, the underlying tissue may harbor a smoldering infection.

The perforation in one of the bones of MD (case 1, left ear) shows that the epidermis is capable of extending around the "corner" and growing on the inner surface of the drum membrane, thus lining the membrane on both sides. The bone of CO (case 2) demonstrates how infected subepithelial tissue in the region of the eustachian tube may extend into adjacent marrow cavities and also into the region of the gasserian ganglion.

CONCLUSIONS

1. The anatomy of the petrous bone may vary considerably as regards pneumatization.

2. Approximately 34 per cent of the bones studied showed pneumatic spaces in the petrous tip.

3. The distance between the cochlea and the internal carotid artery, just below the level of the tegmen tympani, varied from 4 to 10 mm., with an average distance of 6.2 mm.

4. In acute suppurative otitis media and simple chronic otitis media there may be an associated infection of the petrous bone, depending on the degree and extent of pneumatization. Thus, the petrosa may be extensively infected, yet the condition may be clinically unrecognized.

5. Intracranial complications may occur by extension from the antral region or from infected pneumatic spaces in the petrosa.

6. The labyrinth seems well protected from infections of this type.

7. In perforation of the membrana tympani, the epidermis is able to grow around the "corner" onto the inner surface.

GENICULATE GANGLIONITIS (HUNT'S SYNDROME)

CLINICAL FEATURES AND HISTOPATHOLOGY

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Inflammation of the geniculate ganglion, analogous to inflammation of the dorsal root ganglions in herpes zoster, as pointed out by Hunt,[1] produces a series of characteristic signs and symptoms. They include deep-seated pain in the ear and in the region of the mastoid, herpes of the auricle and the external auditory canal and, not infrequently, when the inflammation spreads beyond the limits of the geniculate ganglion to involve the motor fibers of the facial nerve, homolateral facial palsy. Involvement of the auditory nerve is likely to occur and give rise to tinnitus, impaired hearing and vertigo precipitating nausea and vomiting. The infrequency with which this syndrome is reported and the atypical features in this instance prompt us to record this case.

REPORT OF CASE

History.—J. S., a man, aged 51, was admitted to the neurologic service of Dr. I. Strauss on Jan. 16, 1931. Six weeks prior to admission to the hospital the patient noticed a disturbance in his sense of smell. To relieve this condition his right antrum was irrigated three weeks later. This was soon followed by pain and swelling of the tissues around the right eye, and two days later partial paralysis of the right side of the face, followed by total deafness in the right ear, developed. Under treatment, the facial paralysis and hearing apparently improved slightly, but three days before admission the patient suddenly noticed swelling in the throat and experienced pain and difficulty in swallowing. At the same time he complained of pain in the sacral region and noticed a red and painful swelling about 5 or 6 cm. in size on the right leg. He had lost from 30 to 40 pounds (13 to 18 Kg.) in weight during the course of his illness.

The essential features in the past history were a diminution of hearing in the left ear for the past one and a half years. At no time was there any discharge from either ear.

From the otologic service of Dr. I. Friesner and the Department of Laboratories of Mount Sinai Hospital.

1. Hunt, J. R.: (*a*) Herpetic Inflammation of the Geniculate Ganglion; A New Syndrome and Its Aural Complications, Arch. Otol. **36**:371, 1907; (*b*) A Further Contribution to the Herpetic Inflammation of the Geniculate Ganglion, Am. J. M. Sc. **136**:226 (Aug.) 1908.

Examination.—The patient appeared chronically ill and somewhat wasted. His temperature was elevated (101 F.). The sclerae were injected; the conjunctiva, swollen and edematous. The entire right side of the head was swollen. The pharynx showed a mucopurulent discharge. The larynx was swollen and edematous. The liver was palpable four fingerbreadths below the costal margin; the spleen was barely palpable. On the mesial aspect of the right ankle a red, swollen, painful area was present. There was a peripheral facial weakness on the right side with impairment of taste of the anterior two thirds of the tongue on the same side. The fundi showed engorgement of the veins. Both middle ears were essentially normal. An exostosis was present in the right external canal. Tuning fork tests disclosed a total loss of hearing in the right ear and slight nerve impairment on the left side. Caloric tests revealed a total loss of irritability of the right vestibular nerve. The hearing and vestibular tests pointed to complete peripheral involvement of the eighth nerve on the right side. A normal response was obtained on the left side.

Course.—Roentgen examination of the nasal accessory sinuses showed a thickened lining of both antrums. The antrums were irrigated, and a small amount of pus was obtained from the right side. Cultures revealed Staphylococcus aureus. Intranasal antrotomy was performed, and a thickened mucous membrane was disclosed. Marked tenderness developed over the lower dorsal and upper lumbar spine, but roentgen examination revealed no pathologic changes. A systolic murmur was noted, and the possibility of a subacute bacterial endocarditis was considered.

For six weeks the condition remained unchanged; then pain abruptly developed in the left ear. The temperature rose to 102 F. A large bleb was found on the tympanic membrane partially occluding the external canal. A second bleb was noted on the auricle and another on the pinna. The drum membrane appeared somewhat reddened and thickened. There was no aural discharge. The hearing was markedly impaired on that side. The condition was thought to be in the nature of Hunt's syndrome. Two days later a partial paralysis of the lower part of the face appeared on the side of the herpes. The blebs remained for twelve days and gradually disappeared. At this time a thin purulent discharge from the left middle ear appeared.

At the end of the second month epididymitis developed on the right side, and four weeks later pains developed in the back. Blood appeared in the urine. Bleeding on urination became profuse in spite of irrigation of the bladder. The hemoglobin was 41 per cent. Continuous intravenous injection of saline and blood transfusions did not interrupt the patient's gradual decline, and he died three months after admission.

Autopsy.—A summary of the general changes found at autopsy follow: periarteritis nodosa involving the kidneys, testicles, heart and mensenteric arteries; multiple aneurysms (periarteric) of the kidneys which ruptured into the renal pelvis; chronic purulent inflammation of the right antrum; chronic emphysema and chronic bronchitis, and parenchymatous degeneration of the myocardium and liver.

Histopathologic Observations on the Seventh, Eighth and Fifth Nerves (Dr. J. Globus).—The left geniculate ganglion cells were markedly disintegrated and enveloped by numerous capsule cells. Others showed moderate alterations such as shrinkage, deformity of the cell outline, variable loss of internal structure and pyknosis of the nucleus. An occasional relatively well preserved cell was found among markedly diseased cells (fig. 1).

The left seventh nerve in close proximity to its ganglion showed advanced degeneration. Numerous gitter cells were seen arrayed in parallel lines or forming solid groups, often whorls. These cells were large and round or oval and they presented a clear cellular membrane. The nucleus was displaced to one side. The

Fig. 1.—Photomicrograph of the left geniculate ganglion showing cells which have undergone degeneration. A relatively well preserved cell is still present at the upper left side.

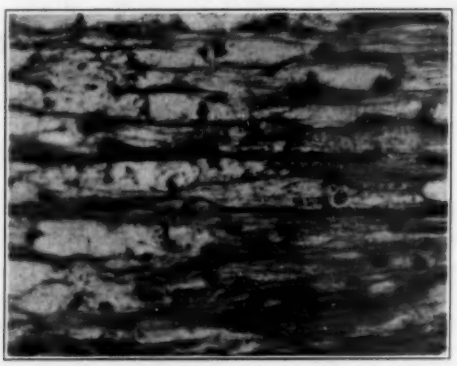

Fig. 2.—Photomicrograph of the left seventh nerve adjacent to the geniculate ganglion. The degenerated nerve fibers are surrounded by numerous gitter cells, lymphocytes and plasma cells.

cytoplasm showed numerous granules or fenestrations. Interspaced between these cells were numerous lymphocytes, plasma cells and eosinophils (fig. 2).

The left eighth nerve showed moderate degeneration. Here, too, were found an occasional gitter cell and lymphocytic infiltrations. The most pronounced changes were seen in the meningeal covering of the nerve. The latter was markedly infiltrated with mononuclear elements. At one end of the eighth nerve a small

collection of ganglion cells (Scarpa's ganglion) was found. The cells showed marked degenerative changes and were enveloped by many mononuclear elements.

The left gasserian ganglion showed no obvious alterations in the ganglion cells, and no accompanying fibers were noted.

The right geniculate ganglion showed no obvious histologic alterations.

The right seventh nerve was apparently normal, though a moderate increase in interstitial glia cells was noted. One vessel in its meningeal covering showed advanced obliteration of its lumen.

The right eighth nerve showed no obvious alterations.

The right gasserian ganglion and trigeminal nerve were normal as to histologic appearance.

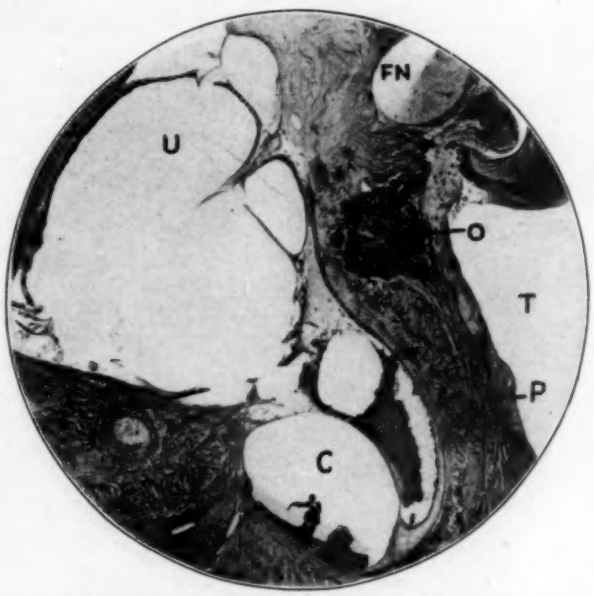

Fig. 3.—Photomicrograph of a vertical section through the vestibule on the left side showing purulent exudate in the first turn of the cochlea. An area of otosclerosis is present at the site of predilection. *C* indicates the cochlea; *FN*, the facial nerve; *T*, the tympanum; *U*, the utricle, and *O*, the otosclerotic area.

Microscopic Examination of Temporal Bones.—Left: The mucosa lining the tympanic cavity was somewhat thickened and showed inflammatory changes which were undergoing resolution, as evidenced by the presence of granulation tissue and the formation of scar tissue. These changes were most prevalent on the inner tympanic wall, particularly in the region of the oval and the round windows. A dense network of fibrous tissue was present at the niche of the round window which extended into the scala tympani. Inflammatory changes were also noted in the mucosa lining the peritubal and periantral cells and in the pneumatic spaces of the petrous pyramid. Fresh hemorrhagic exudate was present in the vestibule, utricle, semicircular canals and cochlea. In some areas of the labyrinth, particularly in the first whorl of the cochlea, there was seen purulent exudate which had undergone organization and fibrosis (fig. 3).

A patch of otosclerosis was noted at the typical site in the region of the oval window (fig. 3). There was no ankylosis of the foot plate of the stapes.

Right: There was a marked suppurative process in the tympanic cavity and in the adjacent pneumatic spaces, with necrosis of the mucosal lining. Considerable scarring was present in the region of the round window as well as in the first whorl of the cochlea. An old hemorrhagic exudate was found in the internal auditory meatus and in the fallopian canal about the geniculate ganglion. Fibrosis had taken place in the membranous portion of the labyrinth with ossification. This process of ossification was most advanced in the cochlea, particularly in its first turn (fig. 4). An area of otosclerosis was present in the region of the oval

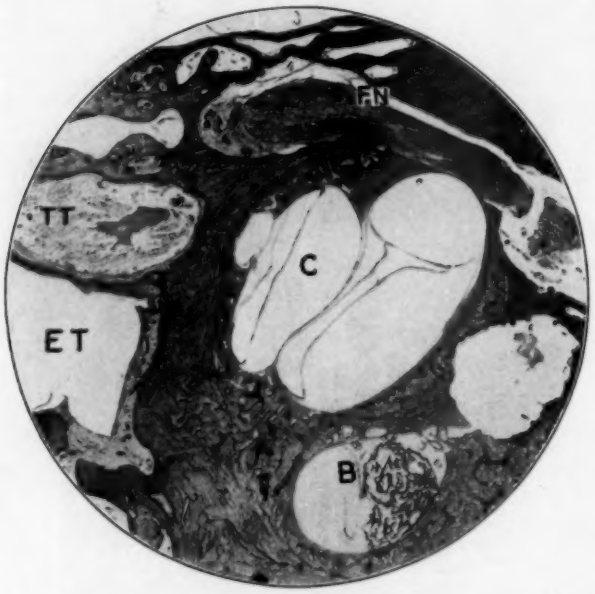

Fig. 4.—Photomicrograph of a vertical section through the cochlea on the right side showing new bone formation (*B*) as a result of an inflammatory process in the cochlea. *C* indicates the cochlea; *FN*, the facial nerve; *ET*, the eustachian tube, and *TT*, the tensor tympani muscle.

window, but was considerably smaller than that of the opposite side. The stapes was not fixed, but instead, was somewhat subluxated.

As on the left side, no changes in the blood vessels typical of periarteritis nodosa could be found, though a thorough search through sections was made to include the apex of the petrous pyramid.

Comment.—A striking feature of the clinical picture was the evolution of signs and symptoms characteristic of Hunt's syndrome. This condition was ushered in by pain in the left ear, accompanied by a rise in temperature to 102 F. This was followed by the appearance of a large bleb on the tympanic membrane, partially occluding the external canal, and somewhat later by blebs on the auricle. Hearing

became impaired, and partial paralysis of the lower part of the face on the same side appeared two days later. The blebs lasted about twelve days, and on drying up, disappeared in about a week. Suppuration of the left middle ear began on the twelfth day of the herpetic eruption.

On histologic examination, the geniculate ganglion showed degenerative changes of cells and of nerve fibers in the adjacent seventh nerve and, to a lesser degree, in the eighth nerve. Degenerative changes in the ganglion cells and in the adjacent nerves are not characteristic of Hunt's syndrome. Usually the ganglion cells differ little from the normal, or they may show evidence of inflammation without degenerative changes. However, degenerative alterations have been found in the so-called "rheumatic" conditions of the facial nerve by Winkowski, Dejerine and Theonari (cited by Hammerschlag).[2]

An additional unusual finding in our case was the presence of histologic evidence of a bilateral suppurative labyrinthitis, though there were no clinical symptoms of labyrinthine irritation. A total loss of labyrinthine function on the right side (side opposite the Hunt syndrome) was present prior to the appearance of the herpes, at which time the tests on the left side showed slight nerve deafness with normal vestibular findings. The left middle ear, as was stated previously, began to discharge for the first time after Hunt's syndrome was well established. Culture was not made from pus from the middle ear, although Staphylococcus aureus was obtained from both antrums of Highmore.

In the absence of symptoms of labyrinthine irritation, it is difficult to explain the pathologic findings of a bilateral labyrinthitis. However, on histologic examination, a bilateral suppuration of the middle ear was found. In all probability, the labyrinthine involvement was but an extension of the suppuration in the middle ear. Labyrinthitis was more advanced on the right side than on the left. In the former the reparative changes consisted of scar formation and actual bone replacement, whereas in the latter the process was still in the infiltrative stage.

In view of the fact that the patient was suffering from periarteritis nodosa with bleeding into various organs, it is possible that the pathologic changes in the labyrinth may be accounted for in a similar manner.

Of further interest is the presence of an otosclerotic process in the labyrinthine capsule on both sides. This condition had not been suspected clinically, though the patient had had poor hearing for the past one and one-half years.

COMMENT

Because of some variations in the clinical manifestation of this syndrome, Hunt considered the following clinical subgroups:

A. Herpes Oticus: This is the simplest expression of the condition, which is probably due to the disease being limited to the geniculate ganglion. It may be preceded by the mild prodromal symptoms of herpes zoster, with preherpetic pains localized in the ear and in the region of the mastoid.

B. Herpes Oticus with Facial Palsy: In addition to the herpes oticus, there is an associated facial palsy on the corresponding side. The paralysis is complete, making its appearance with or soon after the onset of the eruption.

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2. Hammerschlag, V.: Die rheumatischen Affectionen des Gehörnerveapparates, Arch. f. Ohrenh. **3**:1, 1901.

C. Herpes Oticus with Facial Palsy and Hypo-Acusis: In this group herpes oticus and facial palsy are associated with a disturbance in hearing. This disturbance is usually transient and of mild degree. Tinnitus aurium may or may not be present.

D. Herpes Oticus with Facial Palsy and Ménière's Syndrome: This is the severest type. In addition to the symptoms noted in the other groups, the highly disturbing symptoms of Ménière's syndrome, such as tinnitus aurium, deafness, vertigo, nystagmus, vomiting and disturbance of the equilibrium, are also present.

Each type in the enumerated forms is very likely dependent on focal disease of the geniculate ganglion, varying in the degree of extent and severity. Involvement of the seventh and eighth nerves is due to the close proximity to the inflamed ganglion.

The herpetic eruption which is the outstanding feature in the syndrome varies considerably in extent, and is distributed over the tympanic membrane, external auditory canal, concha, tragus and superior aspect of the external surface of the lobule.

There is reason to believe that the geniculate ganglion may in certain cases participate with the ninth and tenth ganglions in the innervation of a cutaneous strip on the most mesial surface of the auricle and adjacent region of the mastoid. In such an event, one is not to assume that this cutaneous zone is exclusively innervated by the geniculate ganglion, but merely that the geniculate zone, which is variable in size and distribution, falls within the area, and that other sensory systems, i. e., those of the fifth, ninth, tenth and cervical nerves, contribute. Thus, in spite of some variations of distribution of the herpes, the several types may be considered as variants of the same disease entity.

That the disease is not common is shown by the following statistics quoted by Hunt.[1b] Gruber found 5 instances in 29,000 cases of aural diseases. Two cases of herpes auris were diagnosed in the Manhattan Eye and Ear Hospital during a period of ten years in which a total of 46,000 cases of aural disease were seen; during a period of five years 1 case was seen in the Brooklyn Eye and Ear Hospital in a total of 15,000 cases. In the New York Eye and Ear Infirmary during the past twenty years the diagnosis was recorded only 6 times.

Because the area of the eruption is often so small as to be overshadowed by the accompanying redness and excessive swelling of the auricle, many cases are regarded as diffuse inflammation of the auricle, perichondritis or frost-bite. In the later stages, when itching and scaling set in, the condition might be confused with eczema of the auricle. The intense neuralgic pain with the appearance of a herpetic eruption in a characteristic location should identify Hunt's syndrome and differentiate it from all other diseases of the ear.

The prognosis is generally favorable if the condition is not associated with some other grave constitutional disorder. The exceptions are the occasional persistence of tinnitus and deafness in the Ménière type. Residual symptoms of facial palsy may also persist.

SUMMARY

The clinical features and histologic changes in a case of Hunt's syndrome are presented. The variations of the syndrome originally described by J. Ramsay Hunt are reviewed. Of additional and unusual interest in the case presented is the histologic evidence of otosclerosis and bilateral labyrinthitis.

ARGYRIA NASALIS

REPORT OF A CASE

LA FAYETTE P. MONSON, M.D.
SAN FRANCISCO

The generalized discoloration of the skin caused by the internal use of silver derivatives has received considerable attention since 1859, when it was studied and reported by Fromann.[1] The number of cases of generalized argyria reported as following the local use of silver nitrate or organic silver preparations, such as mild silver protein and strong silver protein, is considerably smaller.

Occasionally a localized argyrosis following the prolonged local application of these preparations to a small area of skin or mucous membrane is seen. This condition not infrequently follows the prolonged use of these drugs on the conjunctiva. Besides occurring in the eye, localized argyrosis has been reported in the mouth,[2] nose [3] and localized patches of the skin;[4] it is more likely to occur if the skin or mucous membranes have been denuded beforehand.

A review of the literature discloses that involvement of the nasal mucosa, occurring alone or as part of generalized argyrosis, is extremely rare. I have been able to find only two cases in which localized argyria of the nasal mucous membranes was reported. In 1925, Jones [2] reported the case of a patient who used a 5 to 20 per cent solution of mild silver protein locally in the nose every day for eight or nine years, after which there occurred a "discoloration of the membrane in the nose, having a distinct bluish-gray tinge. This also extended in to the pharynx and along the side walls of the throat by the posterior pillars." The other case was reported in 1929 by Odell.[3a] In this case a patient used mild silver protein in the nose for from one and one-half to two years under the direction of a physician. Afterward the patient used it for several years without medical advice. The description stated that skin, mucous membranes, conjunctivae and sclerae were involved.

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1. Fromann, C.: Ein Fall von Argyria mit Silberabscheidungen im Darm, Leber, Nieren, Milz, Virchows Arch. f. path. Anat. **17**:135, 1859.

2. Jones, Marvin: Argyrosis: Two Cases Accompanying Chronic Sinusitis, Laryngoscope **35**:38, 1925.

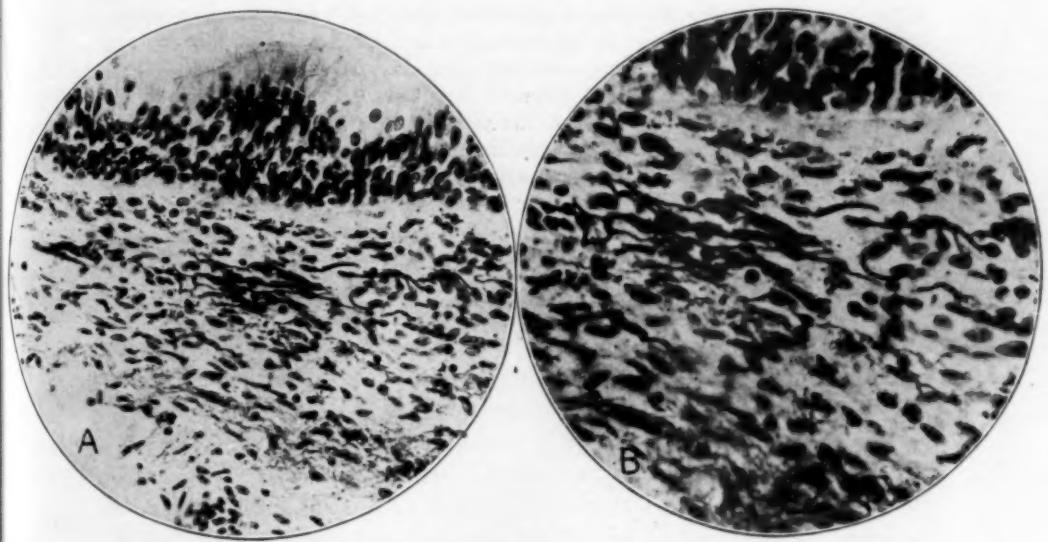
3. (*a*) Odell, A. G.: Argyria, Clifton M. Bull. **15**:10, 1929. (*b*) Jones.[2]

4. Beeson, B.: A Case of Localized Argyria, J. A. M. A. **76**:1006 (April 9) 1921. Olson, G. M.: Argyria Localis Due to Organic Silver Preparations, ibid. **69**:87 (July 14) 1917.

The following case is reported because of the apparent rarity of the condition and also because it may serve as an additional warning against the continued use of a silver preparation for prolonged periods of time without knowledge of the risks involved.

REPORT OF A CASE

History.—Mr. B., aged 40, came under my observation on Dec. 7, 1933, for a routine nasal examination, following an examination in the department for ocular diseases of Green's Eye Hospital. He had had a nasal operation in Reno, Nev., in 1923, when "some bone" was removed from each nostril. The physician prescribed drops of a 1 per cent solution of strong silver protein twice daily.



Photomicrograph of the nasal mucosa, showing the deposit of silver in the form of granules and strands in the subepithelial tissues. Reduced from a magnification of (*A*) × 150 and (*B*) × 400.

Shortly afterward the patient moved to another city. He continued the nasal drops as prescribed without interruption until 1932, when another physician advised him to discontinue them. He had no nasal examination or treatment after that.

Physical Examination.—The general color of the skin was normal. The conjunctivae were normal in color. The nasal interior showed a bluish-green and slate-gray pigmentation, involving all of the nasal mucosa from the mucocutaneous junction back to, and slightly beyond, the choanal rim posteriorly. The mucous membranes of the gums, lips, tongue, pharynx and larynx were not discolored.

Both middle turbinates had been removed, and two moderate-sized bluish-gray polyps were visible in the upper and posterior part of the left nostril. The mucous membranes were hypertrophic, and there was considerable mucous discharge. A postnasal examination revealed that the polyps in the left nostril were growing from the region of the left spheno-ethmoid recess.

Laboratory Examination.—The urine was normal. Examination of the blood revealed nothing abnormal in the red and white cell or in the differential count. There were no morphologic changes present, such as stippling of the white cells and polychromatophilia. The roentgen examination showed grayness of the right ethmoid cells. The other sinuses were clear.

Because of the ocular symptoms, the roentgen finding of a diseased right ethmoid sinus and the clinical evidence of disease in the left ethmoid sinus, a double intranasal ethmoidectomy was performed on December 13. Recovery was uneventful.

The histologic report on the tissue removed at the time was made by Dr. C. Y. Rusk, as follows:

Microscopic Examination.—Microscopic examination of the tissue from the nose showed the surface to be covered by epithelium which was partly columnar and partly transitional. No evidence of malignant alteration was seen. The stroma was markedly edematous and rather extensively infiltrated with lymphocytes and plasma cells. Dilatation of the vessels had occurred. The inflammatory infiltration extended around the deeper glandular structures. In some regions in the left nostril the epithelium was absent, and there was marked fibrosis beneath.

Extensively distributed in the outer layers of the stroma was considerable irregularly clumped pigmentation occurring as granules and fine strands. This pigment had a dark olive cast; at times it occurred in phagocytic cells and at times apparently free. It occurred in the tissue from the right and left nostrils.

Diagnosis.—The diagnosis was: a subacute inflammatory reaction with marked edema of the mucous membrane of the nostrils; pigmentation of the superficial subepithelial tissues according to the clinical history, argyria.

1801 Bush Street.

PLASTIC CLOSURE OF LARYNGOSTOMIC FISTULAS

AND ENLARGEMENT OF THE LUMEN OF THE TRACHEA OR LARYNX BY IMPLANTATION OF A CHONDROCUTANEOUS FLAP

W. WAYNE BABCOCK, M.D.
PHILADELPHIA

The closure of tracheostomic and laryngostomic openings frequently requires several years of painstaking treatment followed by one or more operations which may or may not be successful. Spontaneous closure after a low tracheostomy or closure after a simple operation is usual, but after the conventional high tracheostomy the fistula tends to persist and is often associated with stricture of the trachea or larynx and impairment of the voice. For years Chevalier Jackson has preached against tracheotomy in the subglottic area, but surgical textbooks and practitioners continue to spread the fallacy that a high tracheotomy or cricotomy is the safe and desirable operation to select in an emergency. As a result, in bronchoscopic clinics many voiceless children with openings in the neck are under constant and prolonged treatment. After many months a depth of tracheal gutter sufficient to justify an attempt at closure by operation is developed in these patients in the area of the opening. Not infrequently, however, the lumen after a simple closure is insufficient for respiratory purposes or the fistula relapses. I have noted that the ends of the divided tracheal rings adherent in the scar tend to retract, curl in and obstruct the lumen of the trachea when they are liberated by means of a plastic operation. As a result, the trachea tends to become narrower and flatter than normal, and occlusion results. This effect is accentuated when the margins of skin along the tracheal gutter are liberated and united in the midline. To avoid this a new roof may be inserted into the tracheal opening with eversion of the cartilaginous margins. A pedicled flap formed above, below or at the side of the opening may be used and sutured into place. If a double-pedicled flap is formed lateral to the opening, it is best to jump it over an island of intervening skin so that any cicatricial tension causing the tracheal rings to subtend the area of a fairly large circle is not abolished. Of especial advantage, however, is the excision of a wedge of scar tissue

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From the Chevalier Jackson Bronchoscopic Clinic, Temple University Hospital.

Read at a meeting of the Section on Otolaryngology of the College of Physicians and Surgeons, Philadelphia, Dec. 20, 1933.

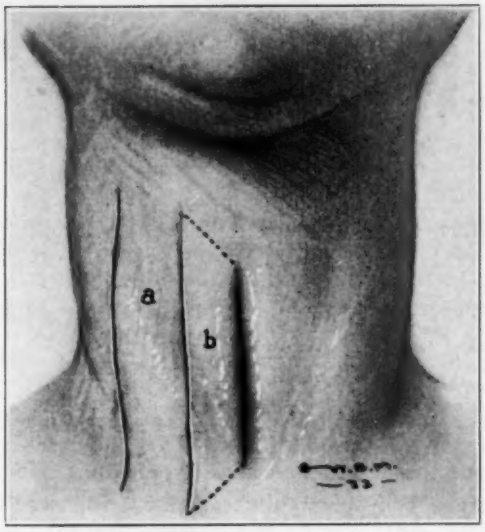


Fig. 1.—Plastic closure of a laryngotracheal fistula following a high tracheostomy: *a*, double-pedicled skin flap to be raised, lined by a full thickness skin graft and stiffened by the insertion of cartilage grafts at the first stage, and *b*, the skin left attached to the trachea, which is later to be displaced to the right. The dotted lines indicate the incisions to be used later, when the flap is transplanted.

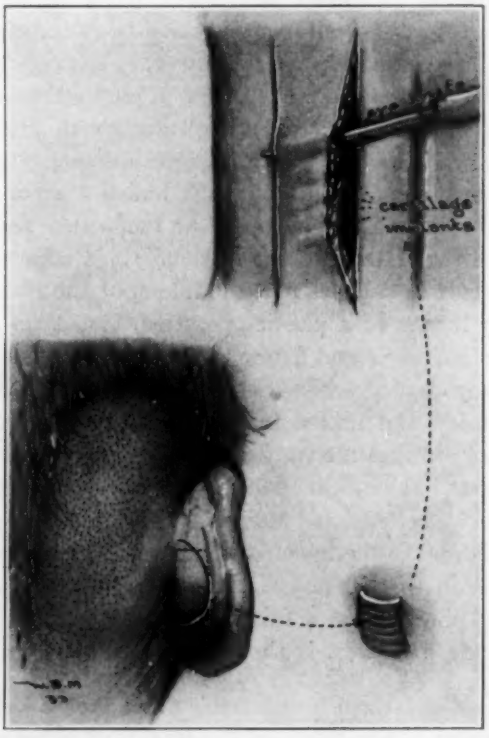


Fig. 2.—Drawing illustrating the method of removing a curved portion of cartilage from the concha of the ear, its division into narrow segments and the implantation of these into the double-pedicled flap in the neck. The deep surface of the flap is lined by a skin graft, and the flap is temporarily replaced and sutured to prevent infection and loss of the grafts.

along each tracheal margin to enable the edges of the trachea to be fixed by sutures in a flared-out position.

If the new roof over the tracheal opening is made of skin and soft tissue, it may sink into, and partially occlude, the lumen. To avoid

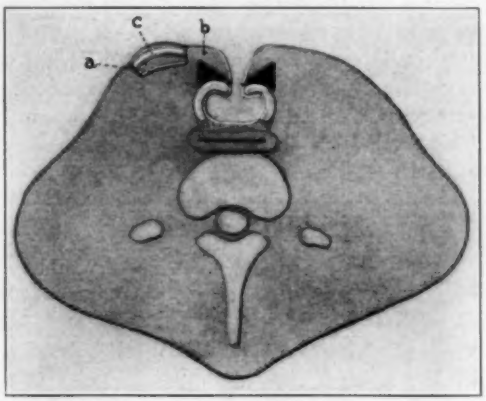


Fig. 3.—Section of the neck showing the wedge-shaped areas removed in order to evert the tracheal margins and maintain a sufficient tracheal lumen, *b*, together with the section of skin flap lined by a full thickness skin graft, *a*, and containing cartilage implants, *c*.

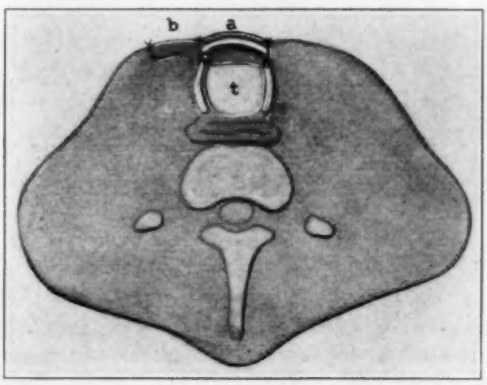


Fig. 4.—Drawing illustrating enlargement of the tracheal lumen by everting the tracheal margins and stepping a lined, double-pedicled flap (*a*) over a segment of skin and (*b*) into the defect.

this I line the flap with skin and insert narrow curved segments of cartilage taken from the concha of the patient's ear in imitation of the tracheal rings. The cartilage of the ear is nonirritating and soon contracts adhesions to the subcutaneous tissue in which it is embedded much as does transplanted nasal cartilage.

REPORT OF A CASE

M. S., a school girl, aged 12, during an attack of diphtheria, at the age of 5, had a high tracheotomy performed to prevent suffocation. A week or so later, repeated unsuccessful attempts were made to decannulate the patient, at which times she became so dyspneic that finally she was referred to Dr. Chevalier Jackson. Dr. Jackson performed a low tracheotomy and carried out progressive dilatations of the larynx over a period of two years, after which the patient was able to return home without the tube in the trachea. On March 28, 1933, the patient returned to Dr. Jackson for the closure of an opening situated at the junction of the subglottic larynx and the upper portion of the trachea, where the original tracheotomy had been performed. This tracheal fistula was a narrow, vertical slit about 4 cm. in

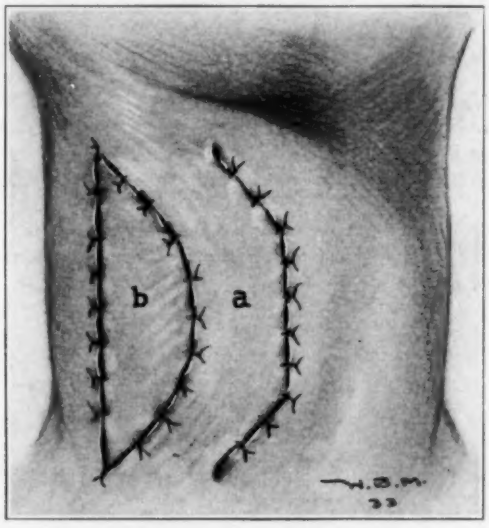


Fig. 5.—Skin closure after transplantation of flap, *a; b,* island of skin remaining over which graft has been jumped.

length, with marked cicatricial margins. A simple closure of the opening by removal of the cicatricial tissue and a separate closure of the trachea and overlying skin by interrupted, fine sutures of silver wire were first attempted. Dyspnea occurred; four days later it was intense. The larynx was found to be practically occluded, and tracheotomy was necessary. It was therefore decided to enlarge the tracheal and laryngeal lumen by implanting a lined double-pedicled skin flap which had been given rigidity and a somewhat curved shape by embedded segments of cartilage. The cartilage reproduced the tracheal rings; it consisted of a section of curved cartilage removed from the concha of the patient's right ear and cut into narrow segments. A narrow, vertical skin flap was raised about 2 cm. to the right of the fistula, the inner surface was lined by a full thickness skin graft taken from the thigh, and into holes made by a von Graefe cataract knife in this pedicled flap the narrow curved segments of cartilage were implanted at short intervals, with the convexity outward. The flap was then replaced and sutured in position. Two weeks later, when the flap was again elevated, the segments of

cartilage were found healed in position, and the epithelial lining was attached. The margins of the trachea and larynx were freed by incisions around the tracheal fistula, and everted by the removal of wedge-shaped segments of adjacent scar tissue. The double-pedicled flap was "jumped" over the intervening island of skin and sutured with interrupted fine sutures of silver wire in the new position as a roof to the open trachea and larynx. A tracheostomy tube inserted in the lower trachea was maintained as a precaution. About three weeks later the tracheostomy tube was removed. Complete closure of all of the openings soon occurred, with comfortable breathing through the mouth. Examination by Dr. Jackson showed a good lumen through the larynx and a slight motility of the arytenoids, and the patient was discharged from the hospital.

SUMMARY

It is often difficult to close a high tracheal stoma without producing a secondary obstruction. In the healing process the divided tracheal cartilages tend to turn inward, a tendency which is partially counteracted by the traction of cicatricial tissue formed lateral to the opening. From freeing the adjacent skin and liberating the tracheal margins tracheal collapse may occur. In operations in which the lumen is small two things may be required: (1) V-shaped resections of cicatricial tissue lateral to the trachea so that the margins may be made to flare outward, and (2) the use of an inlay graft to enlarge the tracheal lumen. The graft may have a single or double pedicle and may be taken from above or below or from the side of the opening. It is desirable to have it lined by hairless epithelium, and stiffened and curved by the introduction of cartilage. Each case may require individualization and a modification of the operative technic. A small but sufficient portion of cartilage may be removed by a curved incision placed behind the concha of the ear without obvious secondary deformity. In a few days these sections of cartilage implanted in the subcutaneous tissues become adherent and form a flap that spreads the tracheal margins and maintains its form in the presence of considerable pressure. The method is also suggested as a means of increasing the lumen of an obstructed larynx when a stoma is not present. After laryngofissure is made, the implant is inserted between the separated margins of the larynx. Very fine silver or, better, rustless steel wire is the preferred material for the suture.

1720 Spruce Street.

LARYNGEAL CYSTS IN THE NEW-BORN

LOUIS KLEINFELD, M.D.
NEW YORK

Laryngeal cysts are supposed to occur very rarely in the new-born, although it is possible that they are overlooked in some instances. Only about fifteen cases have been reported in the literature; of these seven were found at autopsy.

The etiology of these cysts is somewhat obscure, although, in all likelihood, they are congenital anomalies rather than retention cysts. They are usually thin-walled and contain milky fluid. They commonly arise from a broad base in the region of the laryngeal aperture, often from the aryepiglottic fold, in which case they obstruct both the larynx and the pyriform fossa.

CLINICAL DATA

The symptoms may be noticed at birth. They may be marked or, if slight at first, may become severe in early childhood. The main symptoms are:

1. Dyspnea: This is characterized by retraction of the supraclavicular and infrasternal regions. It may also be noticed that the infant breathes better when the head is drawn back (owing to the lessened pressure on the cyst).

2. Cyanosis: As the air hunger increases, this color changes to pallid gray, a distinctly bad sign.

3. Changes in the Voice: Either stridor or aphonia is present.

4. Dysphagia: Even complete inability to swallow may occur. These symptoms in a new-born infant should cause one to suspect laryngeal cyst. The diagnosis may be confirmed by roentgenograms of the larynx and thorax; these not only will rule out the various thoracic conditions which give a similar clinical picture, but may even show the outlines of the cyst with great clarity. The condition can be definitively diagnosed safely and quickly by direct laryngoscopy.

The differential diagnosis lies between: (1) congenital collapse of the larynx; (2) papilloma of the larynx (this and the first-named condition can be ruled out by laryngoscopy); (3) reaction to a foreign body, such as aspirated mucus; (4) atelectasis; (5) thymic enlargement (this and the preceding condition can be diagnosed by roentgenograms of the

chest); (6) patent foramen ovale, which can be ascertained by auscultation.

Prognosis.—The prognosis is good if treatment is promptly instituted.

Treatment.—1. In view of the feeble condition of these new-born infants, the quickest and safest procedure is direct laryngoscopy and incision of the cyst. To prevent aspiration, it is wise to place the head somewhat lower than the rest of the body, as in the Trendelenburg position. Suction should be used constantly. No after-treatment is necessary. The child should be fed within a few minutes after the operation.

2. The fluid may reaccumulate in a few days or months. In such a case a more elaborate operation may be performed. The cyst may be grasped with a slender blunt forceps through a direct laryngoscope and the forceps then held out of the way by an assistant. The contents of the cyst should be evacuated and aspirated and as large a piece of the cyst wall as possible excised with a biting forceps. If sufficient exposure can be obtained, the inside of the cyst can be cauterized, extreme care being used to avoid spilling into the larynx or reaction from overcauterization.

3. If this method fails, or if the patient lives in a locality where the services of a bronchoscopist are not quickly available, a thyrotomy and excision of the cyst may be performed, provided the general condition permits this rather extensive operation.

LITERATURE

Rosenberger [1] reported the case of a child showing dyspnea and cyanosis soon after birth. The child died shortly afterward. Necropsy showed a laryngeal cyst as well as other congenital abnormalities, the most important of which was an azygos lobe of the lung. Lorie and Lux [2] found seven cases recorded in the literature, three of which were found at necropsy, and reported one case of their own. This was of special interest because a laryngofissure was performed, which resulted in a complete recovery except for slight huskiness of the voice. In his recent comprehensive article on laryngeal cysts Myerson [3] reported two cases of congenital cyst each of which required an emergency operation at the age of 3.

1. Rosenberger, H. C.: Cyst of Larynx, Laryngoscope **37**:360 (May) 1927.

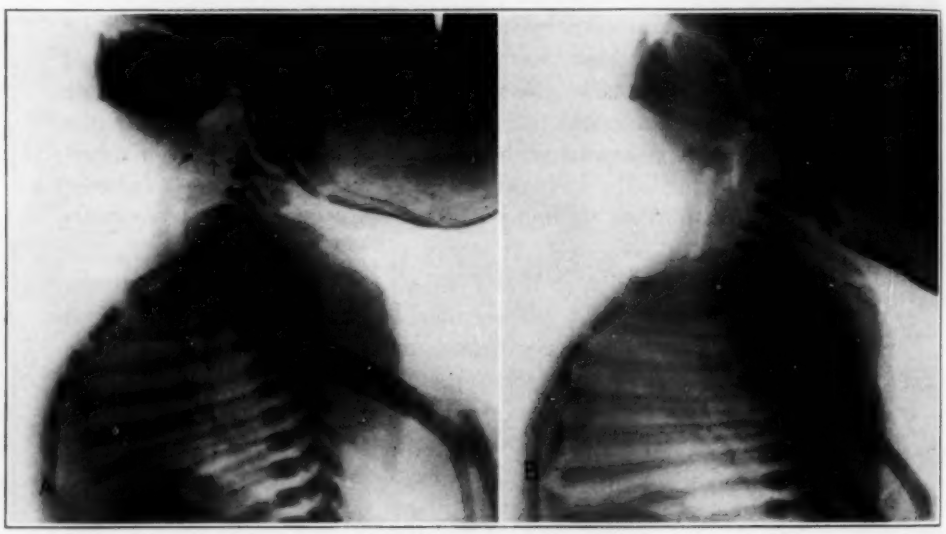
2. Lorie, A. J., and Lux, P.: Congenital Cyst of Larynx, Laryngoscope **42**: 957 (Dec.) 1932.

3. Myerson, M. C.: Cysts of the Larynx, Arch. Otolaryng. **18**:281 (Sept.) 1933.

A patient seen at Mount Sinai Hospital in 1932 presented a laryngeal cyst at birth. This was incised twice, but the child died in about three weeks. At autopsy there was found, in addition to the cyst, a patent ductus arteriosus. The direct cause of death was pneumonia.

REPORT OF A CASE

In May, 1932, a child born at the Bronx Hospital disclosed the following symptoms immediately after birth: aphonia, cyanosis, dyspnea and inability to swallow. The symptoms were somewhat relieved by extending the head. A roentgenogram of the chest was reported by Dr. Snow, the radiologist, to show no abnormality, but a roentgenogram of the larynx showed a definite mass. Dr. Deutschman, the pediatrician in charge of the case, was able to palpate the mass in the hypopharynx.



Roentgenograms of the larynx before and after laryngoscopy. A round mass in the region of the larynx can be seen in *A*. *B* shows that the mass has disappeared following incision of the cyst.

I saw the child in consultation at this time and performed an immediate direct laryngoscopy. A tense yellow cystic mass almost ½ inch (1.27 cm.) in diameter was seen on the left aryepiglottic ligament, almost completely occluding both the larynx and the left pyriform fossa. A suction tube was passed through the laryngoscope and held near the most prominent part of the cyst, which was then incised with a long fine scalpel. About 1 cc. of mucoid fluid was evacuated. By the time the fluid was aspirated there was a marked improvement in the child's condition. The dyspnea and cyanosis had disappeared, the child was crying lustily, and swallowing was normal. A roentgenogram of the larynx then showed that the mass previously noted had disappeared. The procedure was repeated twice in the next few weeks. At the last operation I was able to excise a piece of the cyst wall with a biting forceps. Since that time, nearly a year ago, there have been no further symptoms except an occasional slight hoarseness.

CONCLUSION

1. Dyspnea, cyanosis, aphonia or dysphagia in a new-born infant should lead to a consideration of the possible presence of a laryngeal cyst. The diagnosis can be verified by roentgenogram and direct laryngoscopy.

2. The incision of such a cyst is a simple and life-saving measure.

LINGUAL THYROID GLAND

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CHICAGO

The thyroid gland arises from a ventral invagination of the pharyngeal entoderm just anterior to the first branchial cleft. This point of invagination marks in later life the site of the foramen cecum linguae. The anlage is first a hollow tube. The caudal portion of this tube soon becomes solid and grows down or is dragged down with the trachea. As it descends into the neck it becomes bilobed, and the thyroglossal duct has a double lumen in the caudal portion.[1] The thyroglossal tract begins to atrophy by the fifth week of fetal life, and the bilobed pouch becomes differentiated into the isthmus and lateral lobes of the thyroid gland.

The descent of the thyroid anlage may be arrested at any point between the foramen cecum and the normally placed thyroid gland. The resulting location of these glandular masses can be designated as lingual, sublingual, suprahyoid, infrahyoid, pretracheal or normal and intrathoracic. Thyroglossal cysts may develop from the unabsorbed duct. Often the tract leads through the hyoid bone. This is due to the fact that the hyoid develops later in life than the thyroid, so that when the tract persists the hyoid develops around it. Accessory thyroid tissue not in relation to the thyroglossal duct is not infrequently found (Lawton,[2] Rüter[3]).

The least frequent of all the aberrant locations of the thyroid gland is the lingual. Since Hickman[4] discovered the first case in 1869, about one hundred and thirty cases have been reported in the literature. It is probable, however, that this is not a true index of their frequency. Many cases reported have been manifest only as a small tumor, and this, as in one of our cases, has been discovered more or less accidentally. A small nontoxic mass may be recognized only by an observant laryngologist or may be so placed in the substance of the tongue as to pass

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From the Department of Surgery, Division of Otolaryngology, of the University of Chicago.

1. Marine, D., in Cowdry, E. V.: Special Cytology, New York, Paul B. Hoeber, Inc., 1932, vol. 1, p. 554.

2. Lawton, S.: Lateral Aberrant Thyroid Glands, Surg., Gynec. & Obst. **56**: 697, 1933.

3. Rüter, Emil: Intratracheal Thyroid, Arch. f. Ohrenh-, Nasen- u. Kehlkopfh. **126**:224, 1930.

4. Hickman: Tr. Path. Soc., London **20**:160, 1869.

unnoticed. The laryngologist should be on the lookout for the anomaly since he may be the first one consulted when local symptoms arise.

Grace and Weeks [5] found that lingual thyroid gland occurs eight times as frequently in females as in males. They reported the average age at which the aberrant thyroid tissue is discovered to be 28 years.

The local symptoms, when present, are those of any benign tumor at the base of the tongue. None of New's [6] ten patients complained of pharyngeal obstruction sufficient to warrant removal. In Hickman's patient the mass was so large that it produced respiratory obstruction. Hemorrhage from the large vessels that may course across the tumor occurred in about 10 per cent of some eighty cases analyzed by Dore and cited by Grace and Weeks.

It is evident that the discovery of a lingual thyroid gland does not necessarily indicate active treatment. Of primary importance is the determination of whether or not local obstruction exists and whether or not glandular dysfunction is present. The presence of either of these complications may necessitate some form of active treatment. Should surgical treatment be indicated, it is important to determine whether the condition represents a true ectopia of the gland or simply an accessory mass of thyroid tissue. It is therefore essential to determine the presence or absence of other functioning thyroid tissue as a preliminary step in the surgical attack.

The presence of a normally placed thyroid gland may be difficult to determine if the isthmus cannot be palpated. Ulrich [7] explored the region of the neck in his two patients through an incision as for an operation to remove a goiter, but failed by careful search to discover any thyroid tissue.

In the absence of other demonstrable thyroid tissue complete removal of the lingual goiter is definitely contraindicated. The frequency of myxedema following removal of lingual thyroid glands is relatively great. Lahey,[8] Miller,[9] Ziegelman [10] and others have observed this complication.

It has been observed that the size of the tumor fluctuates in response to the normal physiologic demands of puberty, menstruation, pregnancy and the menopause.

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5. Grace, R. B., and Weeks, C.: Lingual Thyroid, Ann. Surg. **96**:973, 1932.

6. New, Gordon B.: Congenital Obstruction of the Larynx and Pharynx, J. A. M. A. **81**:363 (Aug. 4) 1923.

7. Ulrich, Henry F.: Lingual Thyroid, Ann. Surg. **95**:503, 1932.

8. Lahey, F. H.: Lingual Thyroid, Surg., Gynec. & Obst. **36**:395, 1923.

9. Miller, Richard H.: Lingual Goitre, New England J. Med. **208**:480, 1933.

10. Ziegelman, Edward F.: Lingual Goiter, Arch. Otolaryng. **16**:496 (Oct.) 1932.

During the past four years, three patients with this condition have presented themselves at the clinic. One seen in October, 1929, is the subject of a report by Dr. M. Laurence Montgomery. The other two will be described briefly here.

REPORT OF CASES

CASE 1.—*History.*—Mr. M., aged 55, appeared at the clinic on July 3, 1933, complaining of difficulty in swallowing, especially in the morning, and of "thickening" of his speech. A month previously he had been awakened at 5 a. m. by an accumulation of bloody mucus in his mouth. He expectorated about a cupful during the next hour and a similar amount at 2 p. m. He stated that he had been aware of something in his throat for the past four years and during that time had noted some dyspnea that disturbed his sleep. During the past year, however, the dyspnea had improved. Ten years previously he had a pharyngitis which left him with a "tickling" in his throat. Recently he had sought medical advice and was informed that he had a "growth on his tongue." No additional information was elicited in his history except that he passed some urinary calculi about five years previously.

Physical Examination.—The physical examination showed no abnormalities except for the part pertaining to the tongue. A mass was seen arising from the base of the tongue extending laterally and posteriorly so as to encroach markedly on the lumen of the oropharynx, particularly on the left. It displaced the epiglottis backward and downward. The tip of the epiglottis was seen by examination with a mirror, but no view of the cords was obtained. The mass was normal in color and firm and showed no ulcerations or bleeding points. On palpating the region of the neck, just above the hyoid bone, a firm, deep-seated fulness could be made out. The neck was large, but no thyroid tissue could be definitely palpated in the normal location. The patient's speech was definitely abnormal, having a peculiar "thick" quality described by Torrigianni [11] as "faringolalia chiusa" (pharyngolalia clausa).

Laboratory Tests.—The basal metabolic rate was minus 10.

Diagnosis.—A diagnosis of lingual thyroid gland was made.

Treatment.—Because the mass was obviously producing obstructive symptoms and had bled rather severely on two different occasions, some interference was deemed necessary. It was planned first to determine whether thyroid tissue was present in the normal region by exploring the lower part of the neck. If none was present the lingual thyroid tissue was to be left alone. If thyroid tissue was present it was planned to perform a tracheotomy to be followed by excision of the mass in the tongue at a later date. The patient was so advised but failed to enter the hospital.

Comment.—This patient presented the problem of that group of lingual thyroid glands which need surgical treatment. However, it was deemed better to allow him to continue with the existing difficulty unless the mass could be removed without creating a thyroprival state.

CASE 2.—*History.*—Mrs. T., aged 43, appeared at the ear, nose and throat clinic on Oct. 20, 1932, complaining of difficulty in swallowing solid food. This had come on suddenly and had been present for about a week. She thought

11. Torrigianni, C. H.: Considerazioni sulla ectopia tiroidea della lingua, Scritti biol. **2**:167, 1927.

that during this time her breathing was somewhat obstructed. A week before the onset of her symptoms, on October 6, she found for the first time a small mass at the base of her tongue. For four months prior to this she had experienced a slight soreness on swallowing. She complained of having lost about 25 pounds (11.34 Kg.) in the past two years and of being constipated. She had been employed regularly until twenty-seven months previously. Since then she had been out of employment and had lived a sedentary life at home.

Physical Examination.—Examination revealed a firm, round, smooth elevation of normal color about 1.5 cm. in diameter situated at the base of the tongue at the

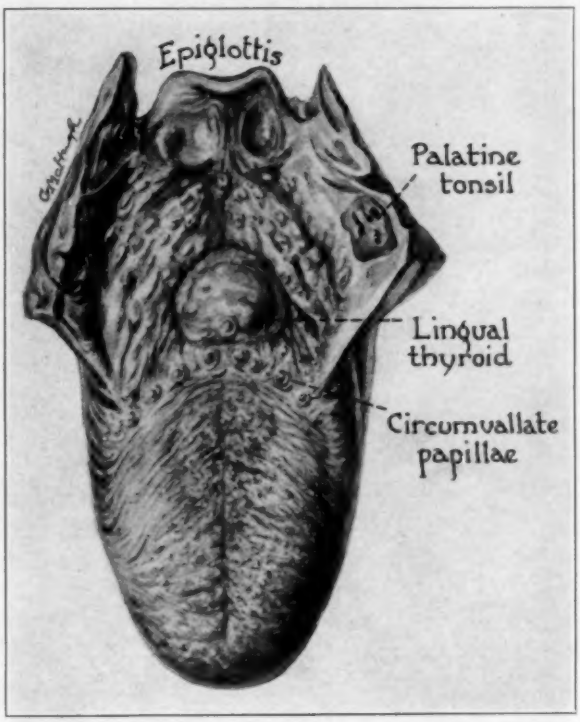

Fig. 1.—Dorsal surface of the tongue (case 2). The circumscribed, elevated mass of thyroid tissue is seen at the site of the foramen cecum.

site of the foramen cecum (fig. 1). This mass could not be seen by simply depressing the tongue but was visualized by indirect examination with a mirror. The patient was obviously apprehensive and nervous. Her blood pressure was 145 systolic and 80 diastolic. Her basal metabolic rate was plus 18, and her pulse rate varied from 80 to 104. An enlarged, firm goiter could be palpated in the neck. The medical department considered that some degree of hyperthyroidism was present.

Laboratory Tests.—The Wassermann and Kahn tests were negative. The results of urinalysis were normal. The blood cell count showed a moderate secondary anemia (60 per cent).

Roentgen Examination.—On account of a persistent complaint of inability to swallow, a roentgen examination of the esophagus was made. The roentgenologist found no obstructing lesion in the posterior portion of the pharynx or in the esophagus. Liquid barium sulphate passed freely. There was a slight tracheal and esophageal deviation to the right at the level of the fifth cervical downward to the fourth thoracic vertebra due to a substernal development of the left lobe of the thyroid gland.

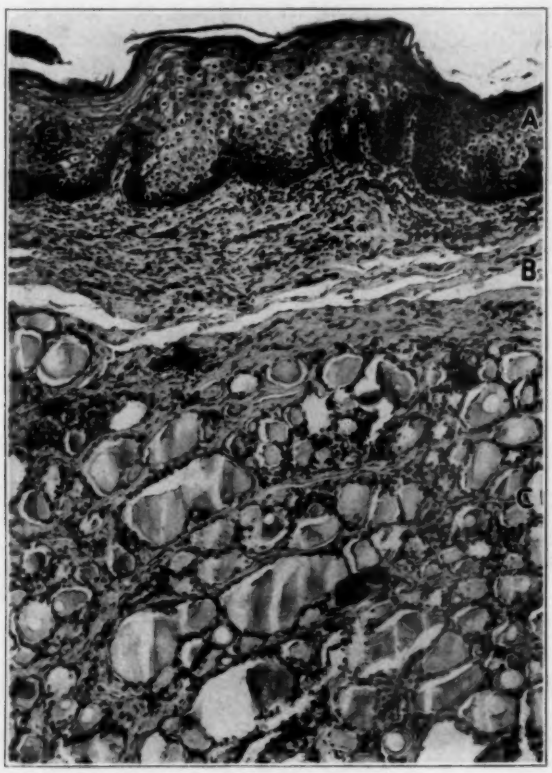

Fig. 2.—Biopsy specimen (case 2) showing normal thyroid tissue covered by the stratified squamous epithelium of the tongue. *A*, stratified squamous epithelium of the tongue; *B*, subepithelial layers; *C*, thyroid gland.

Biopsy.—Under local anesthesia a portion of the mass was removed for biopsy. Palpation of the mass at that time showed it to be firm and deeply embedded in the base of the tongue.

Pathologic Report.—The tissue was made up of a large number of follicles of various sizes, lined by low cuboid epithelium and containing colloid material. The thyroid gland was normal (fig. 2).

Course.—Three days' rest brought the basal metabolic rate down to plus 3. The patient was given compound solution of iodine for a period of two weeks in November. Although it was apparent that the mass at the base of the tongue should not inhibit deglutition, the patient insisted that she could not swallow solid

food, and another roentgen examination was carried out. The roentgenologist (Dr. C. Capp) was left with the following impression: 1. Under fluoroscopy there were normal muscular movements present during the act of swallowing. 2. Considerable difficulty (nervousness? hesitation?) was evidenced in swallowing a solid bougie of barium sulphate and gelatin. Only by direct pressure of the finger applied to the bougie over the base of the tongue was the patient able to swallow it. Certainly no obstruction was present.

It was evident that surgical removal was not necessary, and the patient was reassured that her ability to swallow would return. Four months later she reported that a few days previously she suddenly found that she could "swallow everything." The medical department at that time found her to be in good general health with a basal metabolic rate of minus 4 per cent. She submitted to a hemorrhoidectomy in August. By September she had gained 5 pounds (2.27 Kg.), and at the time of this report, two months later, she was in excellent health.

Comment.—The patient had an accessory thyroid gland at the base of the tongue. The mass was discovered rather late in life either by accident or, more probably, as a result of its having undergone an increase in size. The control of an associated mild hyperthyroidism did not relieve the symptoms of obstruction. In the course of a few months the symptoms left her, without any apparent change in the size of the tumor. In this instance the patient became accustomed to the presence of the swelling at the base of the tongue, and interference with the act of swallowing was overcome without the necessity of surgical intervention.

SUMMARY

The lingual placement of the thyroid gland represents the most unusual type of misplacement of this gland. Three cases have been observed during the past four years at the clinics of the University of Chicago. Two of these are described here. One represents the group in which few, if any, symptoms are present, for which no surgical treatment is necessary and in which the discovery of the lingual gland may be more or less accidental. The other represents the group which is associated with the more classic symptoms of pharyngeal obstruction and hemorrhage, in which usually a large mass is found that must be attacked surgically if the patient is to obtain relief.

PATHOLOGIC CHANGES IN THE HUMAN PALATINE TONSIL

THEIR CORRELATION WITH THE CLINICAL FINDINGS

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The pathologic changes which occur in human palatine tonsils as a result of local infection are well known, for they have been studied extensively in many laboratories, and tabulations and descriptions of these changes have appeared in the literature.[1] It is also known that when a large number of the tonsils removed as a routine are studied in the laboratory, a relatively large percentage are found to be normal. On the other hand, Kellert,[2] found that the tonsillar changes in the clinically healthy young adult are similar in character though less extensive than those in patients with chronic local disease, and he failed to find distinctive changes due to the hemolytic streptococcus. It is not surprising, therefore, that studies on the correlation of the clinical and the laboratory data on the tonsils have not given encouraging results. For instance, Turley [3] attempted to correlate the bacteriologic, pathologic and clinical data in tonsillar disease and concluded that "no definite connections can be shown between" them, and Lippincott,[4] who made a similar study, was led to report that "there are no bacteriological or morphological findings typical of any given symptom or complaint."

Most of the studies in which the pathologic changes in the tonsils have been taken into consideration have been based on observations on one or two sections made in the course of the routine study of a large amount of surgical material. In the light of the present understanding of the function of the reticulo-endothelial system, and the pluri-

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This work was done while the author was a General Education Board Fellow in Pathology at the University of Chicago.

1. Welch, A. S.: Pathologic Changes in the Faucial Tonsils: Statistical Report, J. A. M. A. **89**:2180 (Dec. 24) 1927. Nelson, R. F.: Chronic Tonsillitis: Microscopic Study, Arch. Otolaryng. **5**:249 (March) 1927.

2. Kellert, E.: The Pathological Histology of Tonsils Containing Hemolytic Streptococci, J. M. Research **41**:387 (May) 1920.

3. Turley, L. A.: Relationship of the Bacteriology to the Pathology of the Tonsils and the Relationship of Either or Both to the Symptomatology, Ann. Med. **1**:41 (April) 1920.

4. Lippincott, L. S.: Conclusions from Correlation of Laboratory Findings, Clinical Symptoms and End-Results in Tonsillectomy, New Orleans M. & S. J. **78**:395 (Dec.) 1925.

potentiality of the lymphocyte as proved by Maximow and Bloom,[5] it seems reasonable to assume that a closer study of the cellular components of the tonsil, with a large number of sections from each specimen, may yield information of value. In Maximow's study of inflammation, he observed that cells in the stages of transition from lymphocytes to monocytes and thence to fibroblasts were most abundant and most easily identified in acute inflammation. As human tonsillar material is obtained, in the majority of cases, from patients in whom the local acute inflammation has subsided and the tissues have returned to a state approaching the "physiologic conditions," it is difficult to find and to identify cells in the stages of transition from lymphocytes to macrophages. Yet, the healing or healed stages of the inflammatory process are visible, so that it should be possible to find cells approaching or in the fibroblastic stage, and these changes should appear where the infection is greatest, i. e., about the crypts. Further, the type of correlation which has been sought between the clinical and the laboratory data in tonsillar disease has been a correlation of specific clinical findings with specific pathologic or bacteriologic changes, that is, a qualitative rather than a quantitative correlation. Kellert's observation that in the healthy young adult the pathologic changes are similar to, though not so extensive as, those found in patients with chronic local disease suggests that there may possibly be some quantitative correlation between the pathologic and the clinical data. As it seemed advisable to test the validity of these assumptions, a study of the pathologic changes in the human palatine tonsil was undertaken, and the data were correlated with the clinical indications for tonsillectomy.

MATERIAL AND PROCEDURES

Tonsils were obtained from thirty-five consecutive tonsillectomies performed at the Billings Hospital, and from five patients operated on in one day at the Children's Memorial Hospital. Twenty-four of the patients were males and sixteen, females; they ranged in age from the first to the sixth decade. In six patients, from 7 to 45 years of age, the removed tonsils were "recurrences." Acute nasopharyngeal disease was not present in any patient at the time of operation.

The diameter of each tonsil was determined by measurement, and the volume, by the amount of fixing fluid displaced above the 50 cc. level in a 100 cc. graduate. Fractions of a cubic centimeter were measured with a vernier caliper. All tissues were fixed in formaldehyde-Zenker fluid, embedded in pyroxylin (celloidin) and bisected longitudinally in a plane perpendicular to the surface covered by epithelium. From the central portion of each tonsil fifty sections were cut at 15 microns; they were mounted in series and stained with Maximow's hematoxylin-eosin-azur II. Serial sections for macroscopic examination were made from the remainder of each tonsil with a sharp razor.

5. Studies of the Douglas Smith Foundation for Medical Research of the University of Chicago, 1928-1929, vol. 3.

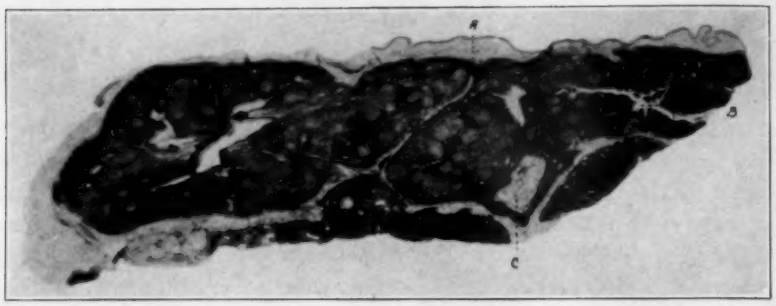

Fig. 1.—Photomicrograph of a tonsil from a woman 24 years old with a history of frequent colds and attacks of tonsillitis. Note the heavy band of subepithelial connective tissue which extends inward from the sides of the tonsil. At *A* is shown a delicate connective tissue union with a trabecula; at *B* is a crypt with four mycelial colonies, and at *C*, a crypt without external communication, which contains round cells, hyaline débris and cholesterol slits. Reduced from a magnification of × 12.

Fig. 2.—Photomicrograph of a tonsil removed from a man 27 years old in whom a diagnosis of "infected tonsils" had been made. An ulcer with slightly undermined edges is shown, which is healing by an ingrowth of granulation tissue from an adjacent trabecula. Reduced from a magnification of × 80.

RESULTS

The relationship of the age of the patients to the degree of tonsillar enlargement appears in table 1. The histopathologic changes in this series correspond, in general, with those found by Kellert in the clinically normal young adult and with those obtained by Welch and Nelson in patients. Though lymphocytes and, less frequently, plasma cells were found in the crypts and infiltrating the epithelium, trabeculae and capsule and, on occasions, the tissues adjacent to the tonsils, only a few mononuclear cells of somewhat larger size and suggestive of transitions from lymphocytes to large phagocytic cells were seen in these sites. Tissue repair appeared to take place as an encroachment on the lymphoid elements by granulation tissue or adult connective tissue, depending on the age of the lesion, either from the marginal subepithelial connective tissue or from the capsule and the trabeculae (figs. 1 and 2). Tumors,

TABLE 1.—*Number of Patients in the Various Age Groups and the Average Size of Their Tonsils*

Age of patients	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60
Number of patients*	1	2	1	2	10	6	3	3	3	2	2	0
Number of patients	3		3		16		6		5		2	
Average size of tonsils, cc.	4.086		2.856		5.281		4.157		3.116		2.535	
Average size of "recurrent" tonsils	Children (1) 0.164				Adults (5) 3.484							

* The ages of the five patients from the Children's Memorial Hospital were not obtained.

abscesses or large ulcerations in the crypts, acute inflammation or peritonsillar abscesses were not found. Some degree of correlation between the clinical findings and the pathologic changes is shown in table 2.

COMMENT

If the average longitudinal diameter of the tonsil is considered to be from 2.3 to 2.5 cm.,[6] in this series the tonsils of the patients in the age period from 26 to 35, inclusive, were above the average size and the tonsils of those in the remaining age groups were of average, or below the average, size. Similarly, when the size of the tonsils was determined by volume (table 2), the tonsils of patients in the first decade showed a much greater average enlargement than those of patients in the second decade, but the greatest enlargement occurred in the third and fourth decades, with a gradual decrease in size through the fifth and sixth decades. The observations in this small series corre-

6. Kellert.[2] Turley.[3]

spond, in a general way, with those of Blos,[7] Schönberger[8] and Pirquet,[9] who studied a large number of cases. As almost all of the patients in this series were adults, the physiologic enlargements noted by Pirquet do not appear, except for the relatively larger tonsils found in persons in the first decade as compared with those in the second decade, but the pathologic enlargement he described in adults does occur.

The pathologic change labeled "invasion of epithelium" in table 2 consisted of granulation tissue-like changes in which capillaries could be seen extending into the epithelial zone, the boundaries of which had become obscured by round cell infiltration and by an irregular downgrowth of epithelial cells, with an apparent loss of basement membrane. The first impression produced by such areas is that with blood vessels

TABLE 2.—*Relationship of Pathologic Changes to Clinical Causes for Tonsillectomy* *

	Reasons for Removal of Tonsils		
	Group 1 Local Reasons (15 Patients)	Group 2 Focal Reasons (10 Patients)	Group 3 Local and Focal Reasons (12 Patients)
Tonsils enlarged above average	40.0	50.0	8.3
Crypts:			
Invasion of epithelium	73.3	90.0	66.7
Polymorphonuclears	73.3	90.0	50.0
Ulcers	6.7	20.0	41.7
Capsule scars	33.3	80.0	83.3
Trabecular scars	66.7	90.0	75.0
Cartilage	13.3	20.0	58.3
Bone	6.0	10.0	41.6
Lymphoid hyperplasia:			
None	0.0	10.0	16.7
Slight	20.0	70.0	58.3
Moderate	100.0	70.0	66.7
Marked	13.3	10.0	8.3
Diffuse scarring	13.3	10.0	66.7

* Recorded in per cent of patients.

so near the lumen of crypts laden with bacteria it should be easy for organisms to gain access to the systemic circulation. On the other hand, the close resemblance of this pathologic change to granulation tissue suggests that possibly here, as in the granulation tissue of wounds healing by second intention, the resistance to the invasion of bacteria is great and the danger of systemic infection, therefore, relatively slight. This appears to be supported by the fact that in table 2 this type of pathologic change shows a relatively high incidence whether the patient's tonsils were removed for local, focal or both local and focal reasons.

7. Blos, Ruth: Der lymphatische Rachenring und die Konstitution, Ztschr. f. Kinderh. **39**:147, 1925.

8. Schönberger, M.: Die Grösse der Gaumentonsillen im Kindersalter, Ztschr. f. Kinderh. **39**:367, 1925.

9. Pirquet, C.: Hypertrophia Tonsillarum infantilis et puerilis, Ztschr. f. Kinderh. **39**:372, 1925.

The tonsils used in this study were obtained from patients in whom there was no acute inflammation of the throat, which accounts for the small number of cells seen in transition stages from lymphocytes to macrophages. It follows, therefore, that the observations made here do not invalidate the opinion that the tonsil may be an organ of defense in which potential phagocytes, as it were, are stored, but it is difficult to understand why the repair of the tonsil appeared as a growth of the perivascular connective tissue from the capsule, trabeculae or marginal subepithelial connective tissue and not as a focal transformation about the crypts.

CORRELATION

As attempts to correlate single pathologic changes with single clinical findings are so unsatisfactory, it seemed desirable to see whether a quantitative correlation between the pathologic and the clinical data could be established. Accordingly, the patients in this study were arranged in three groups on the basis of their clinical histories and physical findings as follows: group 1, fifteen patients whose tonsils were removed for local reasons alone; group 2, ten patients whose tonsils were removed in an effort to eradicate foci of infection, and group 3, twelve patients whose tonsils were removed for both local and focal reasons. Three patients could not be classified in this way because their charts did not include sufficient data to indicate whether there were local, focal or both local and focal reasons for tonsillectomy. A list was made of the types of pathologic change which were considered to be adequate indications of local reaction or damage, and the percentage of the patients showing these types of pathologic change was determined for each group. The data obtained are shown in table 2. It is apparent at a glance that there is some striking correlation between the incidence of certain types of change and the three groups of patients listed. Experiments on the vital staining of the human tonsil by Wassilieff [10] show that dyes injected into the tonsil are spread first throughout the connective tissue stroma, and that fibrosis favors, whereas hyperplasia of the lymphoid tissues reduces, the speed of spreading. If this is true where bacteria are concerned, it is significant that in groups 2 and 3 the types of pathologic change most frequently found were those which would favor the entrance of bacteria from the crypts into the systemic circulation, whereas in group 1 hyperplasia of the lymphoid elements of the tonsil was the most striking feature.

In connection with the debate of long standing on the origin of the cartilage and bone found in the tonsils, it is interesting to note the increasing incidence of these structures from group 1 to group 3. It is

10. Wassilieff, A. A.: Untersuchungen über die Vitalfärbung der Tonsillen, Ztschr. f. Laryng., Rhin., Otol. **16**:121 (Sept.) 1927.

of interest also to note the frequency of infection of the upper respiratory tract and enlargement of the cervical lymph nodes in these groups: In group 1, 95.5 and 60 per cent of the patients had infections of the upper respiratory tract and cervical lymphadenopathy, respectively; in group 2, the percentages were 40 and 10, respectively, and in group 3, 66.7 and 33.3. This lower incidence of infection of the upper respiratory tract and enlargement of the cervical lymph nodes in the last two groups is in accord with the clinical observation that it is frequently the small, silent and buried tonsil, rather than the large and obviously inflamed one, which is most to be feared as a focus of infection from which disease elsewhere in the body may arise.

CONCLUSIONS

Though this series is too small to serve as a basis for conclusions, it is suggestive along the following lines:

1. In the human palatine tonsils removed as a routine there is little evidence of the transformation of lymphocytes into macrophages.

2. Repair in tonsillar disease occurs as an ingrowth of granulation tissue from the capsule, trabeculae or marginal subepithelial connective tissue and not by the focal transformation of lymphocytes about the crypts.

3. In general, the patients with local complaints and physical signs of tonsillar disease have relatively fewer pathologic changes in their tonsils than those with systemic disease or disease elsewhere in the body attributable to the tonsils.

4. Young adults may show as marked tonsillar enlargement as children, in whom enlarged lymphoid structures are common.

EFFECT OF TEMPERATURE ON NASAL CILIA

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In the course of experiments to investigate the effects of certain salts and drugs on the cilia of the nasal mucosa it became apparent that changes in temperature affected the results. This was not unexpected. Cytologists have described with great accuracy the alterations in speed and effectiveness of ciliary action in mollusks and amphibians concomitant with thermal variations.[1] In fact, these activities could thus be accurately controlled. The reactions were reversible, within limits.

By means of an apparatus constructed for the study of cilia in the sinus of the living rabbit and described elsewhere,[2] determinations for temperature were made on freshly removed human mucosa and checked against similar ones made on living rabbits. The results were recorded in cinematographs made at normal speeds.

The portion of the apparatus immediately concerned in the experiments on temperature has not been previously described. It was used for extirpated membranes and consisted of a glass tube 2 cm. in diameter and 10 cm. in length, through which water was allowed to flow, a thermometer in the tube recording its temperature. This tube was fastened on the stage of a microscope and the specimen of mucosa spread on it. The specimen was examined by reflected light. The objective used was 6.5 ×; the ocular, 16 ×; hence (allowing for the interposition of a reflex focuser) a magnification of approximately 115 diameters was obtained on the film.

The water was conducted to the tube, through a mixer, from two containers, one heated and the other iced. Accurate temperatures from 5 to 50 C. could thus be produced and maintained.

Corrections were made in the record for small amounts of heat from the illuminant. These were determined with a thermocouple and after three minutes were found to be 1 C. for the small incandescent bulb used for ordinary examination. Correction for the arc lamp used in photography was 3.1 C. also after three minutes. All the exposures for examination were restricted to that length of time. When it became necessary to supply moisture to the membrane in the form of Ringer's solution, sufficient time was allowed to elapse for equalization of temperature.

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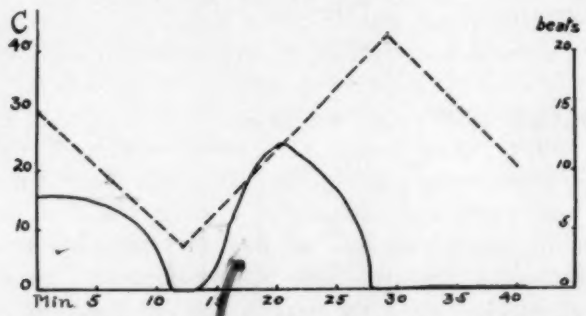
1. Gray, J.: Ciliary Movement, New York, The Macmillan Company, 1928.
2. Proetz, A. W.: Studies of Nasal Cilia in the Living Mammal, Ann. Otol., Rhin. & Laryng. **42**:778 (Sept.) 1933.

For the determinations on the living rabbit a double capillary tube was employed to supply and also to remove the Ringer's solution maintained in a constant flow at the desired temperatures. The fluid passed over the recording thermometer 5 cm. from the contact point, reducing the error to an acceptable minimum.

The frequency of beat was greatest between 18 and 33 C. and varied from seven to ten per second. Controls were maintained at room temperature, which varied from 25 to 30 C. All the experiments were begun with the membrane at 30 C. The temperature was then reduced very slowly and the speed of the cilia noted. At 18 C. there occurred a slight diminution of rate, which progressed with reduction of temperature until in various specimens all motion ceased at points between 7 and 12 C., the lower temperatures predominating in the sinuses of the living rabbit. Owing to the heat supplied by the animal itself and to



Effects of the temperature on the frequency of beat of the nasal cilia. The broken line represents the temperature; the solid line, the number of beats.

the difficulty of observing the cilia while keeping the area at a low temperature, this lower figure is only approximate.

When the temperature was gradually raised, motion was resumed, and by the time the thermometer registered 18 C. it was extremely rapid—much more rapid than at the beginning of the experiment, reaching ten or more per second. This frequency gradually reached the normal once more as the temperature continued to rise.

At 35 C. it became necessary to supply fluids with increasing frequency, owing to evaporation. At 40 C. motion was greatly retarded, and at 43 or 44 C. it ceased entirely. Some groups of cilia succumbed before others, so that before ceasing entirely the motion became ragged and irregular.

On cooling the membrane once more, the cilia remained inactive and motion was not resumed even after several hours at 30 C. Apparently coagulation had occurred and the cilia were permanently injured.

It is curious that these figures correspond fairly closely to those recorded by Gray [1] for Mytilus, a sea mussel, and for the esophagus of the frog. The relation becomes more reasonable, however, in the light of Gray's observation that the responses noted by him are characteristic of muscular responses as well, and this throughout the scale, including the so-called heat rigor at the higher temperatures, following which the tissue is no longer reactive.

No attempt has been made further to refine the methods of observation beyond those described, since our observations dealt solely with the clinical phases of ciliary response, and are more than sufficiently accurate for the purpose.

The practical inferences are twofold: first, that the respiration of cold air does not damage the cilia, especially in view of the fact that inspired cold blasts are constantly alternated with expired ones at 37 C., and second, that if for any reason whatever hot nasal douches are indicated, their temperature should not exceed 40 C., if the cilia are to remain unharmed.

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RUPTURE OF SUPPURATIVE CERVICAL GLANDS INTO THE EXTERNAL AUDITORY CANAL

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It is not uncommon for the general surgeon to see large parotid abscesses perforate through the external auditory canal. Much more rare, however, are instances of cervical adenitis in which the suppurating glands are situated in the upper triangle of the neck and in which the abscess perforates into the external auditory canal. Reports of such cases in the literature are infrequent. It is obvious that recognition of them and of their significance may be of great clinical importance to the otologist, particularly if there is profuse discharge, which not infrequently accompanies this condition.

LITERATURE

MacKenzie,[1a] in 1913, noted a case of suppurative adenitis of the pterygoid region, with drainage via the external canal. Fulkerson [2] and Eves [3] discussed this entity and believed that there were three routes that pus could follow to reach the external auditory canal, namely, (*a*) through the fissures of Santorini, (*b*) through the fibrous tissue between the cartilaginous and bony wall of the canal and (*c*) through a dehiscence in the bony wall of the canal, which is supposed to be present in a small number of cases.[1] In none of the histologic sections that I have examined, have I noted a dehiscence in the floor of the bony canal.

Many cases of retropharyngeal and lateropharyngeal abscess with perforation into the external auditory canal have been recorded. Without making any attempt to include all the cases in the literature, mention might be made of those reported by Bertoin,[4] Tavani,[5] Pearlman,[6]

From the service of Dr. I. Friesner, Mount Sinai Hospital.

1. MacKenzie, D.: (*a*) Otitic Abscess of the Pterygoid Region Drained Through the External Auditory Canal, J. Laryng., Rhin. & Otol. **28**:309, 1913; (*b*) Otogenic Pharyngeal Abscess, ibid. **30**:12, 1915.

2. Fulkerson, C. B.: Report of a Case of Otogenic Pharyngeal Abscess, with a Review of the Literature, J. Michigan M. Soc. **15**:301 (June) 1916.

3. Eves, C. C.: Retropharyngeal Abscess Discharging Through the Right Ear, Tr. Coll. Physicians, Philadelphia **48**:339, 1926.

4. Bertoin, R.: Peritonsillar Abscess with Spontaneous Opening in External Canal, Lyon méd. **149**:113 (Jan. 24) 1932.

5. Tavani, E.: Lateral-Pharyngeal Abscess Forming Fistulas into External Canal; Recovery After Incision and Drainage, Boll. d. mal. d. orrecchio, d. gola, d. naso **50**:208 (July) 1932.

6. Pearlman, S. J.: Retropharyngeal Abscess of Otogenic Origin, Ann. Otol., Rhin. & Laryng. **39**:174, 1930.

MacKenzie,[1b] Cunningham[7] and numerous others who have demonstrated the possible pathways along which pus may spread in the development of retropharyngeal abscess of otitic origin; but I am not concerned with this particular mechanism. Bernstein,[8] commenting on Alexander's statement that mumps with abscess of the parotid in which spontaneous rupture occurred via the auditory canal was rare, reported an additional case, and, in reviewing his protocols, stated that he had seen 3 similar cases, all in girls between the ages of 15 and 17. All the abscesses were on the left side, occurred in the second or third week of the illness and were associated with high fever.

Campbell,[9] in an excellent communication, reported a case of spontaneous rupture through the floor of the external auditory canal of an abscess due to suppurative cervical adenitis.

In 1925, Carter[10] analyzed a series of 125 cases of cervical adenitis. He wrote:

> The lymph nodes, with the exception of a few of those in the superior superficial cervical group lie beneath or within the superficial division of the deep cervical fascia. This anatomical arrangement prevents the spread of the abscess to the superficial fat before it has become well defined, for abscesses formed in the deep nodes do not extend up and down in the plane of fascia in which the node is situated, but point beneath the cervical fascia which eventually becomes involved in the resulting abscess wall.

Carter did not mention any complications, such as rupture of cervical glands through the external auditory canal, in any of his 125 cases. Barrington-Ward,[11] in discussing enlarged glands of the neck, stated that suppurative glands occur most commonly in children about 2 years of age and that they most frequently follow pharyngeal sepsis and are often the result of infected adenoids. Again one notes the absence of any statement about spontaneous drainage through the external auditory canal.

Bruce,[12] in 1929, reviewed 330 cases of cervical adenitis in children. In this series no mention is made of perforation of suppurating glands

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7. Cunningham, H. M.: Retropharyngeal Abscess of Otitic Origin, Tr. Am. Laryng., Rhin. & Otol. Soc. **33**:542, 1927.

8. Bernstein, S. K.: Mumps with Abscess Formation and Spontaneous Perforation into the External Auditory Canal, Monatschr. f. Ohrenh. **62**:212 (Feb.) 1928.

9. Campbell, E. H.: Rupture of Abscesses into the External Auditory Canal, Ann. Otol., Rhin. & Laryng. **39**:144, 1930.

10. Carter, R. F.: Cervical Adenitis; a Surgical Consideration, Arch. Pediat. **42**:627 (Oct.) 1925.

11. Barrington-Ward, L. E.: Enlarged Glands of the Neck, Clin. J. **54**:521 (Nov.) 1925.

12. Bruce, G. G.: The Pathology and Treatment of Cervical Glands in Children; a Review of Three Hundred and Thirty Consecutive Cases, Brit. M. J. **1**: 1030 (June 8) 1929.

through the external auditory canal. One notes from the reports just cited of more than 500 cases of suppurative cervical adenitis in children that there was no description of this unusual complication.

ANATOMIC CONSIDERATIONS

Politzer [13] stated that recent investigations have shown that the lymphatics of the anterior and superior portions of the walls of the canal, the tragus and the surrounding parts, drain into the preauricular nodes (on the parotid); that those of the lobule, helix and inferior wall of the meatus empty into the infra-auricular glands (at the angle of the jaw); that those of the anthelix and concha empty into the mastoid glands (on the apex of the mastoid bone), and that those of the posterior wall of the meatus, together with those of the eustachian tube, empty into the deep cervical glands and retropharyngeal glands.

Wood [14] divided cervical lymph nodes into two main groups: the superficial or collecting nodes and the deep or terminal nodes. The superficial group is made up of the suboccipital, mastoid, parotid, subparotid, submaxillary, submental and retropharyngeal lymph nodes. All these, except possibly the submental and submaxillary, must be considered as possible sources of infection that may spread to the external auditory canal, because they have lymph channels that empty into the highest glands of the deep cervical chain. It is the deep chain of lymph nodes and the retropharyngeal glands that are probably most concerned in the production of abscesses that may rupture into the external auditory canal.

Trotter,[15] in an excellent article on the surgical anatomy of the glands of the head and neck, discussed the significance to the surgeon of knowledge of the relationship of these nodes, the areas which they drain and those into which the glands themselves ultimately drain.

It is not within the scope of this article to elaborate the anatomy of the external auditory canal. Suffice it to say that in young children up to the age of 4 years the attachment of the membranous to the bony portion of the canal is very loose. There is loose fibrous connective tissue, which, as the patient grows older, becomes firm and tense and which unites more densely the cartilaginous and bony portions. It is for this reason that perforations through the junction of the cartilag-

13. Politzer, A.: A Textbook of Diseases of the Ear, ed. 6, Philadelphia, Lea & Febiger, 1926.

14. Wood, G. B.: Surgical Anatomy of Pharynx, Larynx and Neck, in Loeb, H. W.: Operative Surgery of the Nose, Throat and Ear, St. Louis, C. V. Mosby Company, 1917, vol. 2, p. 78.

15. Trotter, H. A.: Surgical Anatomy of the Lymphatics of the Head and Neck, Ann. Otol., Rhin. & Laryng. **39**:384, 1930.

inous and bony portions of the wall are seen much more frequently in children than in adults. Some interesting histologic facts were recorded by Eckert-Möbius,[16] who described the histology of the external auditory canal. He mentioned the interesting fact that only in the cartilaginous portion of the canal does one find fat-containing subcutaneous tissue. In the union between the cartilaginous and bony portions of the canal one finds a ring of thick fibrous connective tissue with numerous elastic fibers. There is little connective tissue covering the bony portion, which is lined with densely adherent periosteum.

REPORT OF CASES

CASE 1.—About eighteen years before this report, a young child was seen in the outpatient department of the otologic service, with a profuse purulent discharge from the external auditory canal. Because the patient had large tender cervical glands, he was referred to the pediatric clinic for a routine complete physical examination. While examining the child, Dr. Murray Bass noted a swelling on the lateral wall of the pharynx. He palpated the mass, and an amazed onlooker noted that synchronously with the pressure on the lateral wall of the pharynx pus welled out of the external auditory meatus. The external auditory canal was carefully wiped dry, and it was then noted that the drum was intact; all the landmarks were distinctly visible. Pressure on the mass in the throat revealed pus coming from a fistulous opening through the floor of the canal at the junction of the bony and cartilaginous portion of the wall. The mass in the throat was incised and drained, and the patient made an uneventful recovery.

CASE 2.—A boy, aged 4 years, when first seen had had pain and aural discharge for two weeks. Except for glomerulonephritis, which was activated on two occasions by attacks of cervical adenitis, the past history was irrelevant. Three weeks before, the patient had had grip. Associated with this large tender cervical glands developed on the right side. The temperature ranged from 99 to 104 F. There were no chills, but the patient acted and looked ill. When first seen, he had a mass of large tender glands situated at the angle of the jaw somewhat in front of the floor of the external auditory meatus. There was a profuse purulent discharge, which filled up the lumen of the external canal. There was no external otitis. The canal was carefully cleaned of all discharge. One noted that the entire floor of the canal at the junction of the cartilaginous and bony portions appeared to bulge up; this made visualization of the entire drum impossible. The portion of the drum which was visible appeared flat and dull. Pressure on the mass in the neck caused pus to well up into the canal. Because the pressure was painful and caused the patient to cry, one could not be sure that the discharge was not coming from a small perforation in the drum, which was hidden by the bulging canal. Wet dressings were applied to the glands, and the patient was reexamined the following day. One could determine that the drum was intact, and by pressing on the mass in the neck one could express a thick discharge into the canal.

16. Eckert-Möbius, A.: Stützgerüst und Haut des äusseren Gehörganges, in Denker, A., and Kahler, O.: Handbuch der Hals-, Nasen- und Ohrenheilkunde, Berlin, Julius Springer, 1926, vol. 6, p. 259.

These two cases are examples of straightforward rupture of suppurating nodes into the external auditory canal, uncomplicated by suppuration of the middle ear. However, cases 3 and 4 present more interesting and difficult problems.

CASE 3.—E. S., a child 13 months old, had a history of fever and discharge from the right ear of four weeks' duration and otitis media and cervical adenitis on the left side of two weeks' duration. One day before admission there was a discharge of a large amount of thick pus from the left external auditory canal, with regression in the size of the cervical glands. On admission to the hospital the temperature was 104 F., and there was marked nasopharyngitis. The hemoglobin was 58 per cent; the white blood count was 11,000, with 78 per cent polymorphonuclears and 22 per cent lymphocytes. Considerable discharge was present in the external auditory canal on the left side. This was cleaned out, and the drum was seen to be intact and a dull gray; all the landmarks were visible. There was a fistulous opening in the floor of the external auditory canal. Pressure on the glands in the neck caused thick creamy pus to reappear at once. There was an innocuous looking suppuration of the middle ear on the right side at this time. The patient was observed for two weeks in the hospital; unmistakable signs and symptoms of acute mastoiditis developed on the right side. Mastoidectomy was performed on the right side. Extensive breaking down was evident. Five days after this procedure a large tender preauricular swelling developed. This was incised and drained. In spite of this, two days later the abscess perforated through the wall of the anterior part of the external canal.

The fistulous tract on the left side healed nicely, the swelling in the glands having subsided. Finally the fistulous tract in the right external auditory canal narrowed down to almost a pinpoint; both middle ears were dry, and the patient was discharged, after having gained considerable weight and done well.

CASE 4.—B. G., aged 2½ years, had an acute infection of the upper respiratory tract, with nasopharyngitis and bilateral superficial cervical adenitis; the temperature ranged from 99 to 104 F. daily. The fever gradually subsided, but after three weeks pain and a spontaneous discharge from the left middle ear developed. The spontaneous perforation the size of a pinpoint was enlarged by the pediatrician. The ear drained moderately for two weeks, and the temperature again ranged from 99 to 103 F. daily. There were no chills; the throat was inflamed, and the patient still had a purulent nasal discharge and large tender swollen cervical glands on the left side. The cervical adenitis on the right side had entirely subsided. One day it was noted that the floor of the left external auditory canal bulged up from below. Then there was a free flow of bloody discharge, whereas previously the discharge had always been mucoid. From this time on the canal, which had previously been wide open, was narrowed; the discharge increased in amount and became thicker, and the temperature still ranged between 99 and 103 F. The drum could hardly be visualized. The child did not sleep well, so hospitalization was advised. Culture of the pus from the ear was reported as showing Streptococcus haemolyticus beta. Tenderness in the mastoid could not be evaluated because of the contiguous acute cervical adenitis. At this time the aural discharge was of four weeks' duration. With wet dressings over the glands and wet wicks of gauze in the canal, the swelling of the floor of the canal subsided somewhat; the granulations in the floor of the canal at the site of the fistulous tract receded, and one was able to see the drum. The discharge could be seen coming from the middle ear; the wall of the canal seemed to sag slightly, and

finally the discharge, which had become less, increased, despite the fact that the condition of the glands had definitely improved. All these facts, plus the additional fact that the patient had an unexplained rise in temperature to 103 F., led me to explore the mastoid. A diseased, broken-down mastoid was exenterated. The postoperative course was amazingly uneventful. There was no reactivation of the process in the gland, and the patient made a rapid, complete recovery.

COMMENT

It is interesting to note that all these cases occurred in children 2½ years old or under. Case 1 is similar in every respect to the cases reported by Bertoin, Eves and Tavani. The presence of suppurative cervical glands, as in case 2, complicates the clinical picture markedly. With the external auditory canal narrowed so that only a small portion of the drum is visible, and with a thick discharge that rapidly wells up from a source which one is unable to ascertain, the otologist is often in a quandary as to the course to pursue. Usually, in such a situation one is unable to evaluate the presence or absence of genuine tenderness in the mastoid because of the adjacent inflammatory edema due to the suppurative glands, in a fractious child. I believe that treatment in such cases should be conservative, namely, continuous compresses to the glands and wet, loose, wicks saturated with a solution of boric acid, 1.2 Gm., and salicylic acid, 0.2 Gm., in 100 cc. of water (Thiersch's solution) placed in the external auditory canal until the observer can be reasonably sure of the source of the discharge. Then, and only then, can one evaluate the signs and symptoms. Fever, toxicity, spontaneous pain and tenderness all can be, and often are, present with straightforward cervical adenitis. The roentgen findings in children, all will agree, may at times be misleading, especially in the presence of edema secondary to adjacent acutely inflamed glands.

CONCLUSIONS

These cases are reported because of their interest and extreme importance to the pediatrician as well as the otologist. In all cases of acute enlargement of the anterior cervical lymph nodes in very young children, associated with aural discharge, the possibility that one may be dealing with a case of rupture of suppurative glands through the external auditory canal must be borne in mind. In my experience, favorable results have been obtained by treating the glands conservatively.

Clinical Notes

REPAIR OF POSTAURICULAR FISTULA FOLLOWING RADICAL MASTOIDECTOMY

C. R. Straatsma, M.D., New York

In a previous article a method of repair of postauricular fistulas by means of a free fat graft was described.[1] This method has been satisfactory, but it is applicable only to cases of fistulas complicating simple mastoidectomy, when the opening between the middle ear and the mastoid cavity is completely closed. Occasionally, however, a fistula occurs following a radical mastoidectomy (fig. *A*). Obviously the use of the fat graft is of no avail in this type of case, because the mastoid cavity and the middle ear are epithelialized and permanently ventilated through the external canal of the ear. The problem in handling this condition is complex because one must supply an epithelialized covering for the cavity, whereas in the repair of such complications following the simple type the endeavor is to fill in and cover the defect. There are several methods advocated for the repair of fistulas utilizing the surrounding tissues, but sometimes these methods fail. In such cases I have used the following procedure successfully in each instance.

PROCEDURE

The scalp flap method is employed in those cases in which closure by utilizing the immediately surrounding skin has been unsuccessful or in which extensive scarring has rendered useless the tissues in the immediate vicinity of the wound (fig. *C*).

The method is divided into three stages, and the approximate time required for completion of the entire repair is five weeks.

A flap 6 inches by 1 inch (15 by 2.5 cm.) is so outlined as to have its base include the superficial temporal artery. The exact size of the flap is determined by the size of the fistula as well as by the amount of cicatricial tissue around the opening. The portion which is to be planted over the mastoid cavity is then elevated from each side, and after the bleeding has been controlled a Thiersch graft is placed on the raw surface of the flap, thus epithelializing that portion which is to cover the mastoid cavity. A period of two weeks is allowed for the Thiersch graft to adhere firmly, after which time the flap is turned down and fixed over the mastoid cavity.

The second stage consists of freshening the edges of the fistula and trimming away such scar tissue as is necessary to assure good approximation. The scalp flap is elevated, turned down and then sutured into the fistula on three sides. The upper end of the fistula is not sutured to the flap at this time as this would interfere with its nourishment. The exposed portion of the skull is then covered with a heavy split graft taken from the thigh, as immediate grafting saves many painful dressings and shortens the convalescent period (fig. *B*).

A period of two weeks is allowed for the flap to become thoroughly healed in its new bed before the final stage is performed. At this time the pedicle is

1. Straatsma, C. R., and Peer, L. A.: Repair of Postauricular Fistula by Means of a Free Fat Graft, Arch. Otolaryng. **15**:620 (April) 1932.

severed at the upper end of the fistula, following which the open edge of the fistula is freshened, undermined and then sutured to the recently severed edge of the transplant. The pedicle is then returned to its original position on the scalp and is carefully sutured down (fig. *C*), after removing as much of the split skin graft,

A, photograph showing (*a*) a posterior auricular fistula. *B*, split graft during the second stage, showing (*a*) the pedicle skin flap. *C*, final stage, showing (*a*) the denuded area covered by a split skin graft, (*b*) scars from a previous attempt at closure, (*c*) transplant and (*d*) undersurface of the scalp flap covered by an epithelial graft before turning.

placed there during the second stage to cover the raw area, as is necessary to make room for its return. Sutures may be removed after one week. This com-

pletes all operative procedures, because the defect left by the removal of the scalp transplant was covered by the previously mentioned split skin graft during the second stage. All incisions are made within the hair-line and hence are covered in a few weeks by the normal growth of hair.

I submit this method because I believe that it is a safe, certain and nondisfiguring procedure for dealing with a postauricular fistula following a radical mastoidectomy which cannot be closed by the customary methods for such repair.

899 Park Avenue.

A NEW NASAL SPECULUM *

IRVING B. GOLDMAN, M.D., NEW YORK

The specific advantage of this nasal speculum lies in its construction whereby the two blades are replaced by a single conical tube. By this method medicinal agents which are applied to the intranasal structures do not come into contact with

Guarded nasal speculum.

the nostril, and thus accidental distribution or trauma to these parts is prevented. The streaking or smearing of the nasal vestibule when caustic agents are used is not uncommon. There result burning, irritation, staining and, sometimes, a temporary scarring which is disagreeable both to the physician and to the patient. With the ordinary nasal speculum it is rather difficult at times to avoid these effects, even when one uses a great deal of caution. With the use of the guarded nasal speculum, such incidents are avoided.

The contour of the speculum aids in focusing the light directly on the area to be cauterized. This region becomes prominent and more easily accessible for therapy.

General practitioners, particularly, may find it advantageous to use this type of speculum for nasal manipulations.

RETROPHARYNGEAL ABSCESS EVACUATOR

O. JASON DIXON, M.D., KANSAS CITY, MO.

The sudden release of pus under pressure from a retropharyngeal abscess has frequently been the cause of death in a patient. The patient either drowns from this sudden inspiration of pus or dies as a result of the pulmonary complication with infection.

* From the Laryngological Service of Mount Sinai Hospital.

The firm base on which the abscess rests and the dense surrounding tissue help to produce a marked increase in pressure. To overcome the danger of this sudden release when the abscess is opened, I have devised this evacuator. It has several different-sized rubber bell-shaped diaphragms which fit snugly over the apex of the abscess. Continuous suction through the handle of the instrument firmly engages the rubber diaphragm over the dome of the abscess, and when the knife is

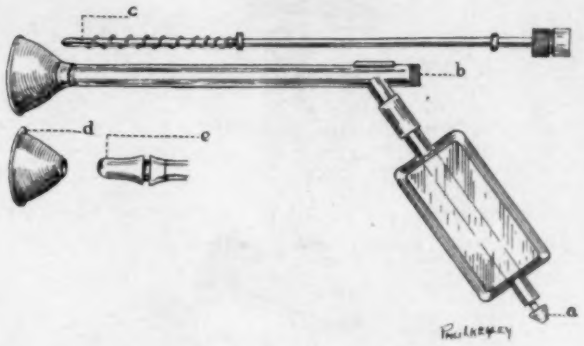

Fig. 1.—The drawing shows: *a*, the tubing connection to the pump; *b*, the tubular sheath for the plunger knife, *c*; *d*, a rubber suction bell; *e*, the fenestrated rounded end.

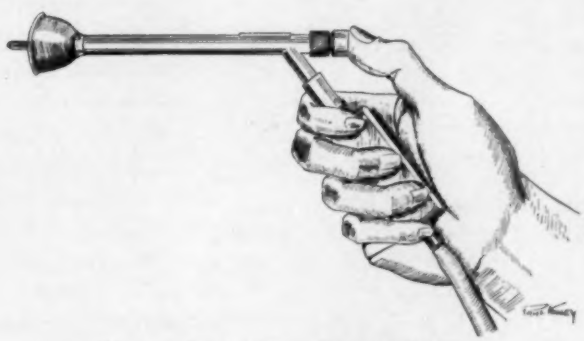

Fig. 2.—The instrument ready for use.

slowly inserted, the escaping pus is rapidly drawn off by the continuous suction. A spring retractor holds the knife up out of place so that the abscess may be completely evacuated without additional trauma.

The instrument may also be used for the opening and draining of a peritonsillar abscess or on other parts of the body where it is desirable to prevent contamination by discharge.[1]

1. The instrument was made by the Phillips-Drucker Company of St. Louis.

EXTENSION HEAD MIRROR LINK FOR SURGEON WEARING BIFOCAL LENSES

CHARLES LUKENS, M.D., TOLEDO, OHIO

Extension head mirror link for surgeon wearing bifocal lenses.

This instrument allows the surgeon perfect vision through his own glasses. The device is simple, inexpensive, indestructible and transferable from mirror to mirror as occasion demands.

Progress in Otolaryngology

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE AND THROAT

GORDON B. NEW, M.D.
ROCHESTER, MINN.
AND
WALTER KIRCH, M.D.
Fellow in Otolaryngology and Rhinology, the Mayo Foundation
DES MOINES, IOWA

GENERAL CONSIDERATIONS

Salinger [1] reviewed the statistical results of the treatment of malignant diseases of the upper portion of the respiratory tract in German and other European clinics and compared them with those obtained in some of the American clinics. He concluded that the greatest progress had been made in the field of irradiation, and that the technics of protracted, fractional roentgen therapy and teleroentgen therapy developed by Coutard, Berven and Hegener offered the most hope for the future. Tables were included in the report.

Dussa [2] made careful and exhaustive postmortem studies in 200 consecutive cases of malignant tumor of the ear, nose or throat for the purpose of investigating the percentage in which distant metastasis to various organs occurred, the various types of tumor that were present and the different sites in which these tumors were found. The article was well worth reading, but was too diffuse and meticulously detailed to be reported at length. The tumors found included carcinoma, sarcoma and melanosarcoma (or carcinoma). The sites of the primary growth were as follows: the ear in 8 cases; the face, nose, sinuses and jaw in 34, the mouth in 22, the pharynx in 43 (including the nasopharynx in 4 and the mesopharynx in 9), the hypopharynx in 27 and the external portion of the neck in 14. The classification of these growths is somewhat doubtful, as it was not determined whether they were primary, except

From the Section of Laryngology, Oral and Plastic Surgery, the Mayo Clinic.

1. Salinger, S.: Malignancies of the Upper Air Passages: Statistical Review, Ann. Otol., Rhin. & Laryng. **42**:850 (Sept.) 1933.

2. Dussa, E.: Ueber die Häufigkeit der Fernmetastasen bei primären bösartigen Tumoren aus dem Gebiete des Hals-Nasen-Ohrenarztes, Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:405, 1933.

for 1 branchiogenic carcinoma, 4 tumors of the thyroid gland, 22 esophageal tumors, 44 laryngeal tumors and 3 tumors of the trachea and bronchi. In 2 cases multiple primary tumors were present; in 1 there was squamous cell carcinoma of the upper jaw and adenocarcinoma of the stomach, and in the other, squamous cell carcinoma of the hypopharynx and adenocarcinoma of the rectum.

Distant metastasis was found in 18 per cent of the cases, the lungs, liver, kidneys and bones being involved with the greatest frequency, although almost every other organ was affected in one case or another. The melanosarcomas presented the most widespread dissemination and the highest proportion of distant metastasis (100 per cent). The sites giving the greatest proportion of distant metastasis were the thyroid and bronchi (each 100 per cent); the site giving the lowest proportion was the ear (1 per cent). Dussa found that tumors of the salivary glands metastasized most frequently to the bones, whereas those of the thyroid gland metastasized most frequently to the lungs. Distant metastasis from laryngeal growths was found to be more common than was usually thought. Cachexia was found to be extremely rare. Each group was given in detail, and the reason for variations discussed. In all cases the disease necessarily was advanced.

NOSE

Epstein [3] reported the results of treatment in 115 cases of epithelioma of the external portion of the nose at the Breslau University Clinic between 1926 and 1930. The epitheliomas were classified as basal cell, squamous cell and mixed. The different groups were described in detail. The final diagnosis can be made only by biopsy, though there is a definite difference in the macroscopic appearance. The growths are important not only because of their frequency as compared to those of other parts of the face, but also because of the special treatment required owing to the presence of underlying cartilage. Surgical removal followed by irradiation was preferred for squamous cell carcinoma, and also for the mixed type tending toward squamous cell carcinoma. In the nonmetastasizing group of basal cell carcinomas, irradiation, especially with radium, was preferred. Since 1928, diathermy had been used to remove the growths, and this had been followed by irradiation. Epstein expressed the belief that in this way the base of the growth is reached by the therapeutic rays with greater certainty. Diathermy alone was not employed. About 60 per cent of the tumors in Epstein's group were basal cell epitheliomas. Ninety-two patients, or 82.5 per cent, had been well from three months to six years after removal of the growth. The sexes were about equally represented.

3. Epstein, S.: Zur Klinik, Histologie und Therapie der Epitheliome der äusseren Nase, Ztschr. f. Hals-, Nasen- u. Ohrenh. **32**:312, 1932.

Tweedie [4] reported a case of melanosarcoma of the septum in a woman, aged 75. The tumor was removed with galvanic cautery, followed by treatment with radium. Fifteen months later there was recurrence, or metastasis, in the antrum, whereas the site of the primary growth was healthy. The patient died two years later, but permission for necropsy was not obtained.

Zahler [5] reported melanosarcoma of the inferior turbinated bone in a woman, aged 39. The patient lived seven years after surgical removal of the growth and treatment with radium, but died eventually of widespread metastasis.

Wieder [6] reported a case of giant cell tumor of the septum, following a blow, in a woman, aged 27. The case is unique in the literature. The tumor was removed with a snare. On account of the microscopic appearance, roentgen therapy was used later. There was no recurrence.

Pushkin [7] reported a case of nasopharyngeal sarcoma in an infant, 3 months of age. Diagnosis of retropharyngeal abscess had been made. Round cell sarcoma was found at necropsy.

Schütz [8] investigated 28 cases of carcinoma of the antrum for the purpose of explaining the high percentage of squamous cell and basal cell epitheliomas in this cavity which is normally lined with cylindric epithelium. Among his cases, the percentage was 85.8; in other statistics culled from the literature, it varied between 78 and 96. Schütz attributed this high incidence to metaplasia of the mucosa which preceded the appearance of the tumor and which was caused by chronic infection; he believed he had convincing proof of this in a number of cases. He discussed the various metaplastic theories in detail. He favored Teutschlaender's theory of metaplasia, according to which transformation of cylindric into squamous cell epithelioma represents an overdifferentiation rather than a regression. This transformation represents a precarcinomatous state. If the causative agent intervenes while the cells are in the mitotic phase, carcinoma results. It is difficult to give an idea of this interesting but complicated theory. A valuable bibliography was appended to the article.

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4. Tweedie, A.: A Case of Melanotic Sarcoma of the Nose, J. Laryng. & Otol. **48**:417 (June) 1933.

5. Zahler, A.: Ein Melanosarkom der Nase, Monatschr. f. Ohrenh. **66**:1416 (Dec.) 1932.

6. Wieder, H. S.: Case of Giant Cell Tumor of Septum Nasi, Laryngoscope **42**:786 (Oct.) 1932.

7. Pushkin, A. F.: Ein Sarkom des Nasenrachenraumes bei einem Säugling, welches einen retropharyngealen Abscess vortäuschte, Ztschr. f. Hals-, Nasen- u. Ohrenh. **32**:467, 1933.

8. Schütz, W.: Oberkieferhöhlencarcinome und Metaplasie, Ztschr. f. Krebsforsch. **39**:152, 1933.

Öhngren [9] reviewed 187 cases of malignant tumors of the maxillo-ethmoidal regions in which treatment in the Sabbatsberg Clinic was given between 1922 and 1931. This monograph, presented in the customary meticulously thorough and exhaustive manner of the Scandinavian school, represents the last word in clinical and pathologic, as well as statistical and bibliographic, treatment of the subject and every physician interested in the treatment of these tumors should read it. The tumors studied involved the upper jaw, the antrum and the ethmoidal region. Tumors of the external portion of the nose and nasopharynx were not included, except when they represented the direct extension of a tumor in one of the sites just mentioned. In the group were 145 carcinomas, 29 sarcomas and 13 mixed tumors; 101 of the patients were males and 86, females. Öhngren attempted to simplify the existing confusion as to the classification of the various pathologic types. He divided carcinomas into squamous cell, with or without cornification, into transitional cell and into the undifferentiated types. He distinguished between transitional cell and lymph cell epitheliomas because of the importance of selecting the proper treatment for each. He did not accept grading unreservedly, because he had found that the same growth may present different grades of malignancy at different sites. Sarcomas were divided into spindle cell, round cell and polymorphous cell and into melanosarcoma, osteoblastic sarcoma, fibromyxosarcoma and plasmocytoma. Öhngren discussed the mixed tumors at length. He had noted and confirmed histologic variations in tumors following treatment, especially irradiation. He had evolved a clinical classification of his own which did not strictly follow pathologic lines but combined them with the more or less unfavorable position of the growth and the presence or absence of metastasis. For this purpose he divided the regions previously mentioned by means of an imaginary plane passing through the inner canthus and the angles of the mandible into an antero-inferior, less dangerous area and a posterosuperior, highly dangerous area. The resulting regions were in turn divided into four parts: two lateral and two medial. The upper and lower lateral regions were of about the same class; the medial antero-inferior regions were comparatively benign, whereas the medial posterosuperior regions were the most dangerous because of their proximity to the base of the skull.

The tumors were divided into three classes of different clinical malignancy and named M1, M2 and M3. M1 comprised basal cell carcinoma, adenocarcinoma arising from mixed tumor, myxosarcoma and papillomatous carcinoma. M2 included squamous cell carcinoma, basal cell carcinoma and all sarcomas except myxosarcomas and melanosarcomas. M3 included all undifferentiated carcinomas and melanosarcomas. A further

9. Öhngren, L. G.: Malignant Tumours of the Maxillo-Ethmoidal Region, Acta oto-laryng., supp. 19, 1933, p. 1.

distinction was made between growth with or without metastasis. Combining these various criteria, the author divided the cases into three groups, the last of which also included all inoperable growths.

The treatment preferred was surgical destruction of the growth with surgical diathermy, combined with preoperative and postoperative irradiation. One hundred and forty-nine patients were treated in this way, the remainder receiving radiologic treatment only because the growth was too extensive for surgical removal. The instruments, both electrosurgical and radiologic, were described at length, as was the technic for both types of treatment. Statistics from various important clinics were given. The etiology and symptoms were also discussed at length. In studying metastasis, Öhngren found that the first metastatic deposits occurred in the choanal lymphatic plexus and in the retropharyngeal nodes, and only later in the carotid and jugular plexuses. In the lower lateral group the first metastatic deposits occurred in the upper cervical chain. He found that the lymph nodes, if not injured by infection, have a strong tendency to filter out and destroy the tumor cells. Öhngren expressed the belief that diathermy diminishes shock, dissemination and hemorrhage and stimulates the respiratory and circulatory centers. He stated that he believed in a most thorough destruction of all visible tumor tissue, even in the nasopharynx. He had found the danger of complications in this area less with diathermy than with irradiation. An analysis of the various complications encountered was given. The operative mortality rate was slight, only 11.4 per cent. Öhngren described the plastic reconstruction method used by him, based on a tubed flap which he evolved. The most interesting modification of the usual, or Gillies', type is the suturing of the flap in layers, thus diminishing tension on the skin, which is fastened in place with clips. Results were given based on 142 cases in which treatment was by the completely developed method; 73 patients had been well one year, 54 two years, 36 three years and 20, five years after treatment. In the various groups, the first and second showed, respectively, 78 and 73 per cent of the patients well five years after treatment, and the third, only 19 per cent. Fifteen patients were treated in the first group, 28 in the second and 106 in the third. An interesting fact was the slightly fewer cases in which metastasis and recurrence were present when preoperative ligation of the carotid artery was performed. Complete tables were given as well as a complete report of each case.

PHARYNX

Cade,[10] in an interesting paper, discussed the problem of radiologic treatment of tumors of the mouth and pharynx. He divided growths of

10. Cade, S.: Radiation Treatment of Carcinoma of the Mouth and Pharynx, Lancet **2**:4 (July 1) 1933.

epithelial origin into squamous cell and transitional cell epitheliomas and lympho-epitheliomas. These were found to vary in response to irradiation; there were also individual variations in each group. Factors in this variation were the stroma surrounding the growth, the situation and the lymph and blood supply of the growth. Irradiation has less effect on tumors in the presence of sepsis or anemia. Cade expressed the belief that irradiation is the treatment of choice for all malignant tumors of the mouth and pharynx. The technic used at Westminster Hospital was described, which is essentially that of Regaud, Coutard and others. The most satisfactory results were obtained by mass irradiation with increased distance and filtration. Cade described an apparatus invented by him for the application of radium in the antrum following destruction of the growth by surgical diathermy. A hollow model of shellac was made in which the radium needles were inserted. For growths in the hypopharynx, transthyroid pharyngotomy was done without, however, opening into the cavity of the pharynx. In patients who were resistant to irradiation, Cade found that alternation of roentgen rays with radium proved of considerable benefit. The radium bomb used at Westminster Hospital was described. No statistics were given, but Cade claimed results comparable to those obtained with surgical measures in operable growths.

Gordon-Taylor [11] described his method of treating malignant disease of the oropharynx. He had completely substituted diathermy for surgical removal, except as a method of approach to certain carcinomas of the tonsillar region in which he performed resection of part or the whole of the lower half of the jaw on the side affected. He had had no experience with irradiation, but he believed that eventually it would supplant all mutilating operations. In those cases in which he performed preliminary ligation of the external carotid artery, he performed block dissection of the lymph nodes at the same time. However, this was not the rule with him as only once had he encountered serious hemorrhage. If the cervical nodes were not palpable and the primary growth was small, he did not think block dissection necessary. Biopsy specimens were obtained with the endotherm knife. Excellent illustrations accompanied the article, but there was no report of cases.

Patterson,[12] in discussing the treatment of carcinoma of the oropharynx, stated that carcinomas arising from the tonsillar region and extending forward to the base of the tongue were less malignant, as regards successful surgical treatment, than were those

11. Gordon-Taylor, G.: Malignant Disease of the Oropharynx, Including the Fauces, Proc. Roy. Soc. Med. **26**:888 (May) 1933; J. Laryng. & Otol. **48**:463 (July) 1933.

12. Patterson, N.: Malignant Disease of the Oropharynx, Including the Fauces, Proc. Roy. Soc. Med. **26**:896 (May) 1933.

following the inverse route. He has found diathermy preferable to the knife or to irradiation. The lymph nodes presented the most difficult problem in treatment. The diagnosis of metastatic nodes was sometimes very difficult. Patterson pointed out that there may be enlarged nodes due merely to infection, or nodes may contain deposits of tumor tissue without any macroscopic evidence of the fact. He preferred to do block dissection before resecting the primary growth. Occasionally, he did not advise dissection of the nodes if the patient's condition did not warrant it or if there was little hope of permanent cure of the primary growth. In such cases he advised irradiation and observation over many years. He expressed the belief that a carcinoma arising in the deeper parts of tonsillar crypts may account for some of the obviously malignant lymph nodes which are encountered in some cases in which the primary growth cannot be found, and that careful palpation may reveal these nodes, but that enucleation of the tonsil and microscopic examination may be resorted to. He advised the use of the endotherm knife in obtaining a biopsy specimen in order to avoid dissemination. Fifty cases of carcinoma involving all parts of the mouth and pharynx were reported. Of the patients in this group, 13 had been well from three to fourteen years, 8 had died and the remainder were still well after varying periods.

Quick [13] discussed his modifications in the use of radon seeds in the hypopharynx. The main disadvantage of the procedure formerly lay in the necessity for inserting the seeds through the mouth under conditions of poor visibility and with almost constant contamination and infection. After extensive external roentgen treatment and shrinkage of the growth, Quick estimated its site and extent carefully by indirect and direct laryngoscopy, and he then approached the tumor by the external route. Thus necrosis of the cartilage can be avoided, infection does not occur and the lymph nodes can be treated at the same time. Anatomic details were given, and the operative technic was described. The reports of two cases and some excellent illustrations accompanied the paper.

Beck and Guttman [14] reviewed the subject of carcinoma of the hypopharynx. They divided these growths according to site of origin as follows: those of the aryepiglottic fold, those of the pyriform sinus, those of the lateral wall, those of the posterior wall and those of the postcricoid region. The various characteristics of growths in these sites are discussed. Advances in surgical technic have increased the percentage of good results, especially for growths of the aryepiglottic folds and of the lateral and posterior wall. Trotter's lateral transthyroid operation

13. Quick, D.: Radium Implantation in Certain Growths of the Hypopharynx, Radiology **21**:114 (Aug.) 1933.

14. Beck, J. C., and Guttman, M. R.: Carcinoma of the Hypopharynx, Ann. Otol., Rhin. & Laryng. **42**:286 (March) 1933.

was advocated and described at length. Great strides have also been made in radiologic science in the treatment of this condition. Beck and Guttman described Coutard's principles and technic as giving the most hopeful results. They concluded that the outlook for this type of growth was not so hopeless as was formerly thought, and that well chosen methods of treatment would give good results in many cases.

Capps and Dunhill [15] reported an unusual case of carcinoma in a pharyngeal pouch. The diagnosis was made with the esophagoscope, but a filling defect in the pouch could be seen with the fluoroscope. The patient gave a history suggesting diverticulum for the previous thirty years, and his father and an uncle had suffered from similar symptoms. He came for consultation because of the recent development of hemorrhage from the mouth. He died, finally, from postoperative hemorrhage.

Mutschler [16] reported a case of amyloid tumor in one tonsil diagnosed after excision. He reviewed the isolated amyloid tumors of the upper portion of the respiratory tract reported in the literature. He discussed the etiology of these growths and came to the conclusion that chronic irritation should be added to tuberculosis and to chronic infection as an etiologic factor in the origin of these tumors. The patient in his case was a woman, aged 35, who was employed in a cigar factory.

Tanturri [17] reported a case of metastatic tumor of the tonsil, and reviewed 9 similar cases from the literature. The metastatic growth developed from a teratoma of the testis. A good bibliography was appended.

LARYNX

Vail [18] reported a case of schwannoma of the larynx. He expressed the belief that his case was the first to be reported under that name, but he had identified tumors in which the diagnosis had been reported as neurofibroma, neurinoma or, perhaps, fibrosarcoma as belonging to this same rare type of growth. As the name indicates, these tumors arise from the syncytial cells of the sheath of Schwann. The case reported concerned a woman, aged 50, with a history of hoarseness of three years' duration. The tumor covered the larynx and was removed endoscopically under suspension. Preliminary tracheotomy was done. In cases reported in the literature, operation had been performed by the external route, and in all paralysis of the vocal cords had resulted. In

15. Capps, F. C. W., and Dunhill, T. P.: Squamous-Celled Carcinoma Occurring in a Pharyngeal Pouch, Brit. J. Surg. **20**:689 (April) 1933.

16. Mutschler, H. H.: Lokales, tumorförmiges Amyloid, solitär in einer Gaumentonsille auftretend. Mitteilung eines Falles, zugleich Beitrag zur Klinik und Genese der Amyloidtumoren, Ztschr. f. Laryng., Rhin. & Otol. **24**:228, 1933.

17. Tanturri, V.: Contributo ai tumori tonsillari secondari, Tumori **6**:351, 1932.

18. Vail, H. H.: Schwannoma of the Larynx, Ann. Otol., Rhin. & Laryng. **42**:476 (June) 1933.

the case reported by Vail, the injury to the nerves was avoided by the endoscopic route. Photomicrographs were included.

Charschak [19] discussed cysts of the epiglottis which he divided into three groups: (1) true, (2) dermoid and (3) congenital. He reported 3 cases in the latter group. These tumors are benign, and the treatment of choice is surgical removal.

Pfeiffer [20] reported treatment of laryngeal papilloma at the Frankfurt Clinic. He discussed various forms of treatment, especially that with roentgen rays. He mentioned the injection of procaine hydrochloride into the base of the papilloma following removal for the purpose of modifying the nerve supply. Cautery with carbon dioxide snow resulted in some success, but he warned against the use of fuming nitric acid as advocated by other German investigators.

Stewart-Harrison [21] reported 144 cases of malignant tumor of the pharynx and larynx in which treatment at Zurich University Roentgen Institute was given by protracted, fractional roentgen therapy. This method, which is essentially Coutard's, had been used at that clinic since 1929. Coutard's technic was described in detail, and the radiosensitivity of the various types of malignant growth was discussed. Stewart-Harrison concluded that although certain types of tumor are definitely more radioresistant than others, no rule can be drawn and clinical experience is the best guide.

Of the 144 patients in this group, 116 received the complete course of treatment; with the others, treatment was interrupted because of excessive reaction and poor general condition. The treatment was not considered finished until complete exfoliation of the mucosa and skin had taken place. The theory on which Coutard's method is based was given at length. Of the 116 patients who received complete treatment, 40, or 35 per cent, had been well from nine months to three and a half years. Fourteen died, without recurrence after six months, from intercurrent disease. Stewart-Harrison compared the results with those obtained at other clinics and at the Zurich Clinic before the Coutard method was adopted. While the results were too recent for definite conclusions, he was convinced that in all malignant conditions of the pharynx (epipharynx, mesopharynx and hypopharynx) this treatment is the method of choice. In the larynx, although surgical intervention is still the method of choice, protracted, fractional irradiation must seriously be taken into consideration and in many cases preferred. In cases

19. Charschak, E.: Zur Frage der Epiglottiszysten, Monatschr. f. Ohrenh. **67**:61 (Jan.) 1933.

20. Pfeiffer, W.: Zur Behandlung der Kehlkopfpapillome, Ztschr. f. Laryng., Rhin. & Otol. **23**:280, 1932.

21. Stewart-Harrison, R.: Malignant Disease of the Larynx and Pharynx, J. Laryng. & Otol. **47**:725 (Nov.) 1932.

in which the tumor appears to be resistant to roentgen treatment, radium may be added or, occasionally, diathermy may be employed to remove the tumor rest. Radium gives the best results when used in bomb form (teleradium).

Figi [22] reported 4 cases of sarcoma of the larynx. This condition, once considered common, has been proved to be extremely rare. In 713 cases of malignant diseases of the larynx seen at the Mayo Clinic since 1910, only these 4 cases of sarcoma were encountered. Figi reviewed the literature on the subject and concluded that many cases reported as sarcoma were probably epithelial in nature. Sarcoma of the larynx is more common in men; the usual rule of age incidence in sarcoma of other parts of the body does not obtain here. All of the cases reported were in men over 60 years of age. Usually pedunculated, the sarcoma may arise in any part of the larynx, but it more frequently has its origin in the vocal cords. It rarely ulcerates, does not tend to infiltrate surrounding tissues and is slower to metastasize than carcinoma. The diagnosis can be confirmed only by biopsy, although the tumors are likely to be smooth and nonulcerated, which distinguishes them from carcinoma. Treatment may often be more conservative than in the case of carcinoma, because a large growth may arise from a thin pedicle. In 2 of Figi's cases operation was performed by the endoscopic route under indirect laryngoscopy without recurrence; 1 patient who was operated on in this way later underwent laryngofissure because of recurrence. The fourth sarcoma, arising from the subglottic region and the only one of the group that did not originate in the vocal cords, was explored by laryngofissure, but almost complete laryngectomy was necessary. Two of the growths were fibrosarcoma, 1 was fibromyxosarcoma, and the other, fibrochondrosarcoma; they were graded 1, 2, 3 and 4, respectively. The patients had been well eight, seven and two years, respectively; 1 patient died sixteen months after operation from influenza and was apparently free from recurrence. Detailed reports of the cases concluded the article.

Benjamin [23] reported a case of laryngeal carcinoma in which, by means of serial sections, he was apparently able to prove the independent appearance of multiple, completely separated epitheliomas on the vocal cords.

Clerf and Crawford [24] reported 32 cases of carcinoma of the larynx in which the patients survived more than three years. The growths were divided microscopically into low grade (6), intermediate (20) and

22. Figi, F. A.: Sarcoma of the Larynx, Arch. Otolaryng. **18**:21 (July) 1933.

23. Benjamin, C. E.: Sur l'origine multicentrale du cancer de la corde vocale, Rev. de laryng. **54**:273 (March) 1933.

24. Clerf, L. H., and Crawford, B. L.: Carcinoma of the Larynx, Arch. Otolaryng. **16**:676 (Nov.) 1932.

anaplastic (6). Five growths recurred in the intermediate group and 1 in the anaplastic group. The authors expressed the belief that the grading of tumors required further study. They were unable to differentiate satisfactorily any but the extremely benign from the extremely malignant growths. No details as to treatment were given. These investigators agreed with Helvig that biopsy can do no harm in open lesions and should always be performed in laryngeal lesions. Good photomicrographs accompanied the article.

Orton [25] reported 32 cases of laryngeal carcinoma in which one-stage laryngectomy, according to Mackenty's technic,[26] was done. Thirteen patients had been well more than two years (1 for eight years). One patient died after two and a half years without evidence of recurrence. There were 3 operative deaths from diabetes, abscess and pneumonia, respectively. There were 10 deaths from recurrence, mostly in extrinsic growths; in 1 case recurrence was in the form of a subglottic growth, and in another in a growth of the ventricle with a metastatic node. The mortality rate was 9.38 per cent. A brief description of the technic was given.

Hinsberg and Epstein [27] reviewed briefly 214 cases of carcinoma of the larynx. The cases extended over thirty years and included both intrinsic and extrinsic growths. Thirty-two laryngofissures were performed with a resulting low mortality rate and cures in 80 per cent. Hemilaryngectomy was performed in 35 cases and total laryngectomy in 61 cases, with a mortality rate of 8 per cent. Lasting cures were obtained in from 15 to 20 per cent of the patients with intrinsic growths.

Lewis [28] briefly reported 10 cases in which laryngofissure was performed for carcinoma of the larynx. Four patients had been well for more than five years, 1 died following recurrence, and 5 had been well less than five years. He also reported laryngectomy in 83 cases; 52 of the patients were still living, 32 of them more than five years after operation. Seventy-five laryngectomies were performed on patients with lymphatic metastasis or extension of the carcinoma from the larynx to other organs. Of these, 16 had remained well more than five years; 1 subhyoid pharyngectomy was done, and the patient had remained well for seven and a half years.

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25. Orton, H. B.: Laryngectomy, Single Stage: Operative Results, Ann. Otol., Rhin. & Laryng. **41**:1018 (Dec.) 1932.

26. Delavan, D. B.: A History of Thyrotomy and Laryngectomy, Laryngoscope **43**:81 (Feb.) 1933.

27. Hinsberg, V., and Epstein, S.: Resultate der Behandlung des Kehlkopfcarzinoms durch Operation einerseits und durch Langzeit bestrahlung andererseits, Med. Klin. **29**:177 (Feb. 3) 1933.

28. Lewis, F. O.: Laryngeal Cancer, Surg., Gynec. & Obst. **56**:466 (Feb.) 1933.

Portmann and Philip,[29] in a complete manner, reviewed the subject of laryngeal carcinoma in young persons. They reported 2 cases of their own and reviewed 12 selected from the literature. They concluded that this disease, rare in the young, was of more frequent occurrence among women. Carcinoma is almost always highly malignant in young patients, and its favorite site is in the posterior portion of the larynx. It frequently follows papilloma or polyp of the larynx.

Mullin [30] briefly discussed the problem of the diagnosis of laryngeal carcinoma. He reviewed 99 cases observed at the Crile Clinic and described the preoperative and postoperative measures adopted at that institution. In 49 of the cases reviewed the growths were operable; in these, 12 laryngofissures and 29 laryngectomies were performed. In the group in which laryngofissure was done, 8 patients, or 66.6 per cent, were well; 3 patients died, and 1 had a recurrence—a mortality rate of 25 per cent. In the group in which laryngectomy was done, 11 patients, or 38 per cent, remained well; none had recurrences, and 16 died—a mortality rate of 55 per cent. An interesting feature was the routine use of blood transfusions postoperatively.

New and Fletcher [31] published the results of microscopic examination of 100 larynges removed for carcinoma of the larynx. The purpose of this examination was to discover how far beyond the macroscopic extent of the tumor the carcinoma cells had invaded the tissues. The interesting discovery was made that the microscopic extension of the tumor closely paralleled the grade of malignancy. Carcinomas graded 1 according to Broders' method did not reveal any extension beyond the visible limit; of the remainder, the percentage showing extension was as follows: graded 2, 19.3, graded 3, 41.5 and graded 4, 78.5. It was also found that when biopsy had been done some time before actual removal of the larynx, there was a slightly greater incidence of microscopic extension. It was further noted that the margin of 0.75 cm. advocated by St. Clair Thomson and Colledge was hardly sufficient to prevent recurrence. Seven types of treatment were discussed on the basis of the observations in these 100 cases. The treatment advised was: diathermy with suspension for growths of low grade involving the epiglottic or aryepiglottic folds, or lateral pharyngotomy in the case of large growths; thyrotomy and excision or diathermy for low grade growths involving the anterior two thirds of the vocal cords without fixation; thyrotomy with removal of the growth and part of the cartilage

29. Portmann, G., and Philip, R.: L'epithélioma du larynx chez les jeunes, Rev. de laryng. **54**:1 (Jan.) 1933.

30. Mullin, W. V.: The Diagnosis and Treatment of Cancer of the Larynx, J. Iowa M. Soc. **22**:525 (Nov.) 1932.

31. New, G. B., and Fletcher, E.: The Selection of Treatment for Carcinoma of the Larynx, J. A. M. A. **99**:1754 (Nov. 19) 1932.

for growths of the anterior part of the vocal cords with fixation (if the cartilage is involved laryngectomy is usually advisable); laryngectomy for tumors of high grade and for low grade tumors of large extent, and transthyroid and transhyoid pharyngotomy for tumors of the supraglottic region. Irradiation was recommended for cervical metastasis, and radium and roentgen treatment for inoperable growths. The mortality rate in the 100 cases examined was 8 per cent. The percentage of lasting cures was found to follow the grade of the carcinoma closely, and none of the patients presenting tumors graded 4 survived. For these highly malignant growths, results with irradiation are as favorable as with surgical measures. The combination of surgical intervention and irradiation improves the prognosis.

TRACHEA

Teuber [32] reported a case of adenocarcinoma of the trachea with metastasis to the regional nodes and to the liver. An interesting feature was the previous removal of one lobe of the thyroid gland to relieve dyspnea.

Negus [33] reported cystic adenocarcinoma of the trachea removed by means of thyrotomy following tracheotomy. Radium was employed subsequently.

Tiling [34] reported a case of basal cell carcinoma of the trachea in which treatment consisted of excision and irradiation. He reviewed the literature and tabulated 37 cases which he thought had been missed in other reviews.

ESOPHAGUS

Beck and Guttman [35] discussed the subject of esophageal carcinoma. They found that the mortality rate from this disease was practically 100 per cent. The only patients who have survived the operation were the now famous ones of Torek (well for thirteen years), of Garré (well for twelve years) and of Turner (well for ten years). Gluck operated on 114 patients, of whom 6 survived operation. Beck and Guttman expressed the belief that the earliest symptoms of this condition, cervical and retrosternal discomfort on swallowing, are not given sufficient importance by physicians or laymen. The appearance of these symptoms should make fluoroscopic examination and esophagoscopy

32. Teuber, K. H.: Das primäre Carcinom der Trachea, Ztschr. f. Hals-, Nasen- u. Ohrenh. **33**:444, 1933.

33. Negus, V. E.: Cystic Carcinoma of the Trachea, Proc. Roy. Soc. Med. **26**:238 (Jan.) 1933.

34. Tiling, W.: Ueber Trachealcarcinome im Anschluss an einen Fall von Basalzellen Carcinom, Monatschr. f. Ohrenh. **67**:322 (March) 1933.

35. Beck, J. C., and Guttman, M. R.: Carcinoma of the Esophagus, Ann. Otol., Rhin. & Laryng. **41**:1183 (Dec.) 1932.

imperative. Esophagoscopy is necessary for biopsy and as a check on fluoroscopy, which is susceptible to about a 10 per cent error. They described various methods of treatment. They stated that surgical removal should offer better results than are at present obtained, as the growths in the great majority of cases are limited to the viscus and do not metastasize early. The most favorable cases for surgical treatment are those in which the upper extremity and cervical portion are affected. They described Trotter and Orton's operation for growths of the upper extremity. The results with this operation have been improved by the employment of a skin flap to fill in the defect. For carcinoma of the cervical portion, they recommended a two-stage operation and cited Allen's use of a fascia lata graft and Galloway's use of diathermy. When complete removal cannot be attempted, various palliative methods can be used. They condemned the use of the bougie, except as a preliminary to intubation, because of the danger of splitting the growth and the insufficient results. Endo-esophageal diathermy should be limited to the purpose of restoring viability to the organ; in this connection, Wright's technic was described. According to Beck and Guttman, fairly good palliative results may be expected from high voltage roentgen therapy, radon seeds and radium plaques. Their technic was described. The results were unfortunately of brief duration and successive applications less and less effective. They expressed the belief that teleradiation offered the greatest hope for the future. They advised gastrostomy only if all other palliative measures had failed.

Vinson [36] reviewed 1,000 cases of malignant tumors of the esophagus seen at the Mayo Clinic. In 838 of these, the patients were men. The patients' ages ranged from 20 to 89 years. The great majority were in the fifth decade. Laborers and farmers comprised the majority of the patients, and excessive drinking and eating and poorly cared for mouths were prominent features. There was a noticeably high proportion of Jews (108) in this group as compared with the proportion of Jews in the general registration in the clinic. Dysphagia represented the dominant and earliest symptom in 644 cases, but this symptom, like others, is usually late and may be completely lacking even at the time of death. Vinson thought that carcinoma may arise on a background of a benign lesion of long duration. The average duration of symptoms at the time of examination was eleven months. Metastasis was found to be frequent in the regional nodes, but was rarely found at examination. In 7 cases there was an esophagobronchial fistula, and in 17, paralysis of the recurrent nerve. Vinson considered roentgen examination the most reliable single method of diagnosis. In only 30 of 815 cases were

36. Vinson, P. P.: Malignant Disease of the Esophagus: Study of 1,000 Cases, Northwest Med. **32**:320 (Aug.) 1933.

the results of fluoroscopy negative. He warned against the use of barium sulphate in cases of marked obstruction until dilation had been performed. Esophagoscopy, although it does not always permit of positive diagnosis because normal mucosa may be drawn over the lesion (this occurs in about 20 per cent of cases), is an important diagnostic method. The preferential sites of the tumors were described, and the relatively greater proportion of women presenting growths at the introitus was noted. The great majority of the growths were highly malignant. In 132 of 519 biopsies, tissue was reported as inflammatory; in 264 biopsies, squamous cell carcinoma was reported. One of the carcinomas was graded 1, 19 were graded 2, 122 were graded 3 and 118 were graded 4. In 95 biopsies, adenocarcinoma was reported. One was graded 1, 27 were graded 2, 27 were graded 3 and 24 were graded 4. The remaining biopsies showed 1 melano-epithelioma; 3 colloid carcinomas and 1 lymphosarcoma. In 5 cases the growth was removed surgically; in 4 of these the patients died postoperatively and in the other, the patient committed suicide four months later. The operative results can thus be seen as not very encouraging. Irradiation is just about as hopeless. Vinson had found that the best palliative results follow dilation with bougies. This was performed in 794 cases with 9 deaths from splitting of the growth. Twenty-two gastrostomies were performed with 3 deaths. The mortality rate from this operation varies in proportion to the advancement of the growth. Vinson expressed the belief that intubation offered a logical treatment in the palliative sense, but he had not made use of it.

Watson [37] studied 506 cases of carcinoma of the esophagus seen at Memorial Hospital between 1918 and 1931. Biopsy was performed in 267 cases, and the review is based on these. The author distinguished three types of growth: a bulky polypoid type of tumor with early obstruction; shallow ulcerating lesions with early extension to adjacent organs and symptoms of mediastinal involvement, such as backache, but with late or absent symptoms of obstruction, and a hard, scirrhous growth with a tendency to encircle the lumen and cause obstruction and fixation. In 18.8 per cent of the 267 cases the upper third of the esophagus was involved, in 27.3 per cent the middle third and in 53.8 per cent the lower third. There were 243 squamous cell carcinomas, 19 adenocarcinomas and 5 transitional cell carcinomas. Of 227 of the growths that were graded, 15 were found to be of grade 1, 148 of grade 2 and 39 of grade 3. Diagnosis of tumors of grade 4 was not made. Diagnosis from the point of radiosensitiveness also was made, but only a small proportion (44) were found to be radiosensitive. Watson enu-

37. Watson, W. L.: Carcinoma of the Oesophagus, Surg., Gynec. & Obst. **56**:884 (May) 1933.

merated the causes of death, which included rupture into the trachea of a bronchus, rupture into the aorta, pneumonia, hemorrhage, peritonitis, starvation, cardiac failure, carcinomatosis, septicemia and diarrhea. Etiologic factors considered were chronic infection, poor mastication and excessively hot drinks. Spasmodic conditions were found to be a factor in many cases. This disease was found to represent 2.5 per cent of all cases of malignant disease at Memorial Hospital. The symptoms, diagnosis and treatment were discussed. Gastrostomy was advised in all cases at Memorial Hospital. Internal and external irradiation were used as palliative measures. Tables of the cases were presented. Watson concluded by stressing prophylaxis, especially in the care of the mouth and teeth.

Irisawa [38] reported 120 cases of carcinoma of the esophagus examined at Tokyo Imperial University. Of these patients, 109 were men and 11 women. An interesting fact brought out was the prevalence of drinkers of saké (the national alcoholic drink) among sufferers from this condition.

Eggers [39] reported in detail 17 cases of carcinoma of the esophagus in 13 of which operation was performed. Four patients survived for several months. The progress of the technic has made the possibility of surgical removal of these growths an actuality. The difficulty has been insufficiently early diagnosis. All the patients operated on had had symptoms for at least six months.

Guisez [40] briefly discussed the radium treatment of carcinoma of the esophagus. In all his cases the condition invariably was fatal, but with appropriate technic he was able to prolong life in some cases as long as three years. The most favorable site for treatment was found to be the middle third of the esophagus. Guisez considered radium contraindicated when the tumor had spread to adjacent organs or presented lymphatic metastastis or paralysis of the recurrent nerve.

Loewy [41] reported 11 cases in which carcinoma of the esophagus was treated by dilation. He compared the low mortality rate with this procedure (0.89 per cent) according to Vinson and Moersch's figures with the high mortality rate for gastrostomy, which is as high as 50 per cent in some cases. He found that the length of life was greater following treatment by dilation.

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38. Irisawa, T.: Ein Beitrag zur Statistik des Speiseröhrenkrebses, Gann **27**:194, 1933.

39. Eggers, C.: Experiences with Carcinoma of the Esophagus, J. Thoracic Surg. **2**:229 (Feb.) 1933.

40. Guisez, J.: Les causes de réussite ou d'échec dans la radiumthérapie du cancer de l'eosophage, Ann. d'oto-laryng., Sept., 1932, p. 1028.

41. Loewy, G.: Dilatation des cancers de l'oesophage, Bull. et mém. Soc. nat. d. chir. **59**:801 (May 27) 1933.

Evans [42] reported the case of a woman, 63 years of age, who at the age of 40 had been subjected to removal of the larynx, pharynx, cervical esophagus and a portion of the thoracic esophagus. Permanent gastrostomy and tracheotomy enabled the patient to survive. An ingenious apparatus, consisting of a rubber tube and two specially adapted tubes with metal flanges fitted into the pharyngeal stoma above and the gastric stoma below, enabled the patient to eat in the normal manner through the mouth.

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42. Evans, A.: A Rubber Esophagus, Brit. J. Surg. **20**:388 (Jan.) 1933.

News and Comment

CERTIFICATION OF SPECIALISTS IN MEDICINE

The present trend toward specialization in medicine with the lack of fixed minimum requirements for training and experience in special work has called attention repeatedly of late to the urgent need for official recognition and certification in the United States of fully qualified specialists in various branches of medicine.

Examining boards have been established and functioning for several years in ophthalmology, otolaryngology, obstetrics and gynecology, dermatology and, more recently, pediatrics. Boards are now being formed in radiology and orthopedic surgery as well as in several other special branches of medicine. Citizens of the United States and Canada are equally eligible for examination.

Each of these boards is composed of members appointed by the nationally recognized special societies and the related sections of the American Medical Association.

Their requirements and examinations for certification are rigid and searching and a recent editorial in *The Journal of the American Medical Association* makes the following statement:

"As information concerning the work of these Boards becomes more widely disseminated among both the medical profession and the public, their prestige must grow. Eventually the young man who wishes to make for himself a place in any of these specialties will consider the securing of a certificate by a council-recognized certifying board as the first step in such a procedure. Hospitals will also do well to be guided in their staff appointments by similar qualifications. Movements of this type necessarily develop and advance slowly. However, . . . there is reason to believe that the certifying boards will do much to advance the quality of specialistic service available to the people and to the profession of our country."

Announcement is made of the formation of the Advisory Board for Medical Specialties, previously referred to editorially by *The Journal of the American Medical Association*. The purpose of this board is to coordinate the activities of the various official groups already concerned with postgraduate medical education in the specialties, and to standardize their methods of work and the certification of medical specialists by the existing boards.

It is composed of representatives from the following groups: the Association of American Medical Colleges, the American Hospital Association, the Federation of State Medical Boards of the United States, the National Board of Medical Examiners, the American Board of Ophthalmology, the American Board of Otolaryngology, the American Board of Obstetrics and Gynecology, the American Board of Dermatology and Syphilology and the American Board of Pediatrics. Examining boards in other specialties may be eligible for representation on this board on meeting certain high standards of qualification.

The officers are: president, Dr. Louis B. Wilson, of Rochester, Minn.; vice-president, Dr. J. S. Rodman, of Philadelphia; secretary and treasurer, Dr. Paul Titus, of Pittsburgh, and members of the executive committee, Dr. W. P. Wherry, of Omaha, and Dr. W. B. Lancaster, of Boston.

It is obvious that the Advisory Board for Medical Specialties should have an important influence in an advisory way on undergraduate medical education as well as graduate education in the specialties; it will assist in the active investigation and listing of postgraduate training facilities in both the United States and Canada, and to a lesser extent abroad, so much of which has already been done in this country by the Council on Medical Education and Hospitals of the American Medical Association; and it should be an important influence in effecting a general

improvement in the standards of practice in the various specialties. It has been seriously suggested that the time may soon come when the various states will license physicians to practice as specialists and that American boards' certificates will be the basis of such a license. One province in Canada licenses all of its specialists.

It is expected and planned that the Advisory Board for Medical Specialties will be reportable to and work under the general direction of the Council on Medical Education and Hospitals of the American Medical Association, the latter to be affiliated in a judicial capacity. The details of this affiliation have not yet been completed. Merritte W. Ireland, Surgeon-General of the United States, and Dr. W. D. Cutter, of Chicago, represented the Council as observers at the recent meeting of the Advisory Board for Medical Specialties in Chicago.

The next edition of the American Medical Directory will contain information about the acceptable special boards as well as indicate physicians who are diplomates of the boards. Plans are likewise being formulated for the proposed publication of a Directory of Diplomates which will also contain information regarding post-graduate training facilities, special residencies available, and general qualifications necessary for certification and official recognition as a specialist in any given branch of medicine.

The next meeting of the Advisory Board of Medical Specialties will be held in Cleveland, on Sunday, June 10, 1934, or immediately prior to the next annual session of the American Medical Association.

Abstracts from Current Literature

Ear

HEREDITY AND PREGNANCY IN OTOSCLEROSIS. E. SCHMIDT, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **136**:188 (Sept. 21) 1933.

Schmidt studied the relation of heredity and pregnancy to otosclerosis in 106 patients. This group contained 49 married women who had given birth to children. Of these women about 50 per cent experienced a decided decrease in hearing during pregnancy while the others noticed no changes. The disease was familial in about 50 per cent of the cases. Heredity plays a significant rôle in the etiology of otosclerosis although the exact nature of the hereditary transmission is not known.

EDITOR'S ABSTRACT.

AUDITORY PHYSIOLOGY OF THE VESTIBULE AND HEARING IN FISH. O. GOEBEL, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **136**:277 (Oct. 14) 1933.

Goebel reviews his theory of the auditory significance of the vestibule which he first advanced in 1913. A more accurate knowledge of the histology of the nerve endings in the vestibule since that time has resulted in a new interpretation of some of the details of his theory although it is unaltered in its essential lines of thought. He deals especially with the hearing capacity for noises having the character of H, F or Sch. The neural apparatus of the semicircular canals is, in his opinion, the only organ for the perception of toneless friction noises. He also discusses the hearing in fish.

EDITOR'S ABSTRACT.

DOES SPONTANEOUS NYSTAGMUS OCCUR IN NORMAL PERSONS? W. M. YOUNGERMANN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **136**:314 (Oct. 14) 1933.

Youngermann examined seven hundred patients to discover whether a spontaneous rhythmic nystagmus may exist as a harmless, nonpathologic variety of the involuntary movements of the eye. In six hundred patients a vestibular injury could be excluded with some certainty on the basis of the anamnesis and in one hundred it was unlikely. Among these seven hundred cases a nystagmus was observed in only two cases in which neither the cochlear nor the ophthalmologic nor the neurologic examination disclosed disease conditions. The investigation shows that spontaneous rhythmic nystagmus may occur, however rarely, in apparently normal persons. Whether a disease not demonstrable with the present methods of investigation is the hidden cause is unknown; possibly future observation will bring an explanation of these cases. The necessity of thorough and prolonged examination of such cases is apparent, particularly from the standpoint of insurance. If either of these two patients happened to have suffered an accident with cranial trauma, most investigators would be inclined to attribute the nystagmus to the trauma despite the negative otologic findings. This question demands further investigation but that does not invalidate the fact that spontaneous nystagmus is often the major objective sign of an intracranial injury. In a third case of nystagmus, multiple sclerosis was suspected. The author suggests that spontaneous nystagmus, so often seen in advanced multiple sclerosis, might sometimes be an isolated early symptom of this disease.

EDITOR'S ABSTRACT.

OTITIS CAUSED BY BACILLUS FRIEDLÄNDER. G. EIGLER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **136**:318 (Oct. 14) 1933.

Eigler states that aside from an epidemic of thirty-three cases of otitis caused by Friedländer's bacillus reported by German, only seventeen cases of otitis due to this organism have been reported in the literature. He adds two personal

observations of this rare form of otitis. All of the sporadic cases are severe and with few exceptions show a tendency to develop severe local and general complications. In onset and evolution the condition resembles otitis mucosa. It occurs most frequently in patients of middle age. General metabolic disturbances such as diabetes and cirrhosis of the liver, which occur with relative frequency in this rare form of otitis, constitute the chief dangers for the patient, besides general weakness. In case of early recognition of the etiologic agent by bacteriologic examination (this should include nasal examination because of the frequent rhinogenous origin of the infection) early operation is advisable, as in more than half of the sporadic cases the patients died with suppuration of the bone despite surgical intervention.

EDITOR'S ABSTRACT.

IS ENDOLUMBAR IRRIGATION WITH PHYSIOLOGIC SOLUTION OF SODIUM CHLORIDE IN MENINGITIS WITHOUT DANGER? G. KRIEGSMANN, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:68 (Nov. 14) 1933.

In a case of otogenous meningitis in which Kriegsmann performed endolumbar irrigation with physiologic solution of sodium chloride daily for ten days, starting four days after labyrinthectomy, he observed the development of symptoms of severe spinal injury. Disturbances of the bladder were noted after about fourteen days, and the spinal fluid was xanthochromic and coagulated immediately. A few weeks later lumbar puncture yielded no spinal fluid while suboccipital puncture yielded a clear spinal fluid, indicating complete obliteration of the lower portion of the lumbar spinal canal. Following recovery from the meningitis, the patient exhibited hyperesthesia of both legs, severe atrophy of the muscles of the calf and absence of the achilles tendon, patellar and abdominal reflexes. The great similarity of these symptoms to those produced by endolumbar irrigation with acriflavine hydrochloride and other medicaments leads the author to believe that the spinal injury in this case was caused by the solution of sodium chloride. Endolumbar irrigation should be performed with Ringer's solution, if at all, and should be interrupted immediately on the appearance of disturbances of the bladder, which are the most sensitive signs of spinal injury. In view of the risk of endolumbar treatment and its dubious value, early, complete surgical elimination of the focus of infection and copious withdrawal of spinal fluid remain the best procedure in the treatment of meningitis.

EDITOR'S ABSTRACT.

HISTOLOGIC STRUCTURE OF THE TEMPORAL BONE OF ANTHROPOID APES. F. ALTMANN and E. VERMES, Monatschr. f. Ohrenh. **67**:1199 (Oct.) 1933.

Altmann and Vermes studied microscopic serial sections of the temporal bones of four anthropoid apes: two orang-utans and two chimpanzees. They describe the histology of each specimen separately and also present a general discussion of the facts obtained, particularly as to the conditions of pneumatization and the structure of the bony capsule of the labyrinth.

EDITOR'S ABSTRACT.

PARALYSIS OF THE ABDUCENS IN ACUTE OTITIS MEDIA: TWO CASES. A. REJTÖ, Monatschr. f. Ohrenh. **67**:1247 (Oct.) 1933.

Rejtö observed paralysis of the abducens in two cases of seemingly uncomplicated acute otitis media. In the first case a slight paralysis of the abducens appeared a few days after mastoidectomy. Roentgenography disclosed a few diseased cells in the zygomatic process which had been overlooked. Following the extirpation of these cells and the posterior wall, which was necrotic, the paralysis of the abducens slowly receded. In the other case the paralysis of the abducens appeared during acute otitis media, after spontaneous perforation had occurred. Mastoidectomy disclosed an extensive destruction of bone, starting in the mastoid cells and extending to the apex of the mastoid. On account of the continuation of the abducens paralysis and severe parietal headache, lumbar

puncture was performed. The headache quickly receded, but the severe paralysis of the abducens did not start to recede until six weeks later. The appearance of abducens paralysis in acute mastoiditis shows that the apex of the petrosa is involved; it is an indication for surgical intervention. This region is not always completely accessible and it is therefore all the more important to remove those foci of infection which are accessible. In cases in which there is only inflammation with no suppuration in the apex, removal of the purulent foci which spread the infection will often result in the healing of the deeper, less accessible portions. This was demonstrated in the second case. The appearance of abducens paralysis after mastoid operation is also an indication for surgical intervention, as shown by the first case. In the most thorough mastoidectomy, especially if the infection is not well circumscribed, isolated cell groups may be overlooked, especially in the posterior wall; a second intervention for removal of the epitympanic portion and the posterior wall is therefore indicated if paralysis of the abducens occurs.

EDITOR'S ABSTRACT.

SEVERE LABYRINTH COMPLICATIONS IN ACUTE AND CHRONIC OTITIS MEDIA. F. KOCH, Monatschr. f. Ohrenh. **67**:1251 (Oct.) 1933.

Koch reports four cases of labyrinthine complication in otitis media, which are of interest from the standpoint of either pathogenesis or evolution. They show the forms of evolution which labyrinthine complications may assume, and the diagnostic and therapeutic difficulties which they may present even to one who is experienced. The observations comprise two cases of acute otitis media with consequent labyrinthine and meningeal suppuration and two cases of labyrinthine inflammation after chronic otitis media with formation of a cholesteatoma.

OTORHINOLARYNGOLOGIC EXPERIENCES IN THIS YEAR'S EPIDEMIC OF INFLUENZA. E. ERDÉLYI, Monatschr. f. Ohrenh. **67**:1412 (Dec.) 1933.

Infections of the middle ear were a fairly frequent complication of influenza in the recent epidemic. These often healed spontaneously, but Erdélyi felt that paracentesis was always advisable, since it had no disadvantages, although it was sometimes unnecessary. Mastoid complications were not seen in infants, but occasionally signs of involvement of the mastoid were present in children. Conservative handling was successful in these instances. The accessory nasal sinuses were frequently involved, especially the antrum of Highmore. In many instances satisfactory drainage was established spontaneously, but in some cases operation was necessary. Severe inflammatory changes in the throat were especially noteworthy at the beginning of the epidemic, in December, 1932, and January, 1933. Occasionally edema of the uvula was noted. Two cases of edema of the larynx were observed, both of which progressed favorably before it was necessary to consider operative intervention for the relief of respiratory difficulty.

EDITOR'S ABSTRACT.

THE TEMPORAL BONE IN CASES OF INCREASED INTRACRANIAL PRESSURE. H. BRUNNER, Monatschr. f. Ohrenh. **67**:1450 (Dec.) 1933.

Brunner considers ten cases of increased intracranial pressure in which the temporal bone was available for study. Most of the cases have been described previously or are to be reported separately. Five are related in detail.

In the first case there was a glioma in the region of the left optic thalamus. Examination of the ears showed connective tissue in the ductus endolymphaticus and a small, circumscribed otosclerotic area in front of the fenestra ovalis bilaterally. The second case was one of a cystic glioma of the right side of the cerebellum. Examination of the right ear showed a serous exudate in the cochlea, the sacculus vestibuli, the semicircular canals and the aquaeductus cochleae. It also showed wrinkling of the vestibular membrane, a serofibrinous exudate in the nerve canal,

a small cyst in the macula sacculi, dilatation of the saccule and the ductus reuniens and irregular pneumatization of the temporal bone. In the left ear only a slight exudate in the basal spiral of the cochlea and a fibrinous exudate in the aquaeductus cochlea were found. The third case was one of a tumor in the substance of the left occipital lobe. Both ears showed thickening, hyperemia and cysts of the mucosa of the middle ear, adhesions and a serous exudate in the niche of the fenestra cochleae, union of the stapes with the promontory, and exostoses in the posterior part of the fenestra cochleae, the promontory, the stapes and the posterior surface of the pyramid. There were also deep bony fissures in the tegmen, retraction of the tympanic membrane, hyperemia and small hemorrhages in the modiolus, slight atrophy of the nerves of the vestibular convolutions, relaxation of and formation of cysts in the ligamentum spirale and slight atrophy of the nervus utriculus. In the other cases similar changes were observed except for the additional finding of herniations of the brain.

Five patients were not operated on. A patient with acute edema of the brain and one with acute hydrocephalus showed no change in the membranous inner ear. One with a tumor of the left thalamus showed fibrous tissue in the ductus endolymphaticus. One with a tumor of the right hemisphere of the cerebellum had a serous exudate in the right inner ear. One with a tumor of the left occipital lobe showed small hemorrhages of doubtful origin in the modiolus.

Five patients were subjected to cranial operations. In a patient with a left frontotemporo-occipital glioma, who lived seventeen days postoperatively, hemorrhage of the right inner ear and questionable atrophy of the nerves of the right vestibular convolutions occurred. Another patient with a glioma of the right hemisphere, who survived fourteen days postoperatively, showed petechial hemorrhages in the left inner ear and bilateral edema of the ductus endolymphaticus. A patient with a right quadrigeminal tumor, who lived only a few hours postoperatively, showed no change in the inner ear. Another with a medial quadrigeminal tumor, who lived three days postoperatively, showed fresh hemorrhages in the inner ear bilaterally. The last patient operated on had a tumor of the left hemisphere of the cerebellum. At autopsy a transudate and hemorrhage were found in the inner ear. Herniation of the brain was found in five of the ten patients, but because of the technical difficulties in examination the author feels that it may have occurred even more frequently than this indicates. The herniation in all instances was in the middle cranial fossa, and in one case in the posterior cranial fossa as well. In three cases it was on the right side and in two on the left. In three of four cases of one-sided, or principally one-sided, intracranial tumors, the herniation occurred on the contralateral side.

Observations such as he has made, especially in regard to herniation in relation to increased intracranial pressure, should, the author feels, be carried out in a much larger series of cases, especially in view of the occasional finding of herniation in the absence of increased intracranial pressure. EDITOR'S ABSTRACT.

Pharynx

IDENTITY OF COURSE OF POSTTONSILLITIC SEPSIS AND PUERPERAL SEPSIS. F. A. SCHNEIDER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:75 (Nov. 24) 1933.

Schneider points out the similarity between posttonsillitic septicemia and puerperal sepsis in respect to etiology, pathogenesis, clinical course, complications and therapy. In both diseases the infection may spread by any of the following routes: the hematogenous, the lymphogenous, the lymphohematogenous and the perivascular, phlegmonous route. In both forms of sepsis there is the danger of pyemia, and metastases to the joints, kidneys, lungs and endocardium may occur. In both diseases the phlegmonous process tends to invade the large cavities of the body, causing peritonitis in puerperal infection and mediastinitis in posttonsillitic sepsis. Therapy in both forms of sepsis aims at elimination of the primary focus of infection, exposure of infected interstices and incision of peripheral abscesses.

Ligation of veins in both diseases is indicated only in the event of thrombosis in a case in which the infection tends chiefly toward endophlebitic extension. The percentage of cures in severe cases in which surgical intervention is employed is about 50 per cent in both forms of sepsis. EDITOR'S ABSTRACT.

DIPHTHERIA CARRIERS IN SCHOOL. A. VON ZSINDELY, Arch. f. Ohrenh-, Nasen- u. Kehlkopfh. **137**:215 (Dec. 11) 1933.

Von Zsindely examined cultures from the noses and throats of 1,115 school children for diphtheria bacilli. The percentage of carriers was higher among the boys than among the girls (7 per cent and 5.1 per cent, respectively). Developmental anomalies, such as enlarged tonsils, adenoid vegetation or narrowed nasal passages, appeared to offer favorable mediums for the persistence of bacteria. The presence of carriers with virulent organisms did not invariably lead to an outbreak of diphtheria; conversely, cases of diphtheria developed in the neighborhood of carriers of avirulent organisms. Carriers in schools in all probability transmit the organisms to their neighbors, who may also become carriers. EDITOR'S ABSTRACT.

DIAGNOSIS OF CHRONIC TONSILLITIS. F. HUTTER, Monatschr. f. Ohrenh. **68**:49 (Jan.) 1934.

Hutter believes that tenderness to pressure on the tonsil from inside the throat, and to a lesser degree under the angle of the jaw, is at times a valuable aid in the diagnosis of chronic tonsillitis. EDITOR'S ABSTRACT.

THE TONSILS IN SEPTICEMIA. H. KOLBE, Ztschr. f. Hals-, Nasen- u. Ohrenh. **35**:61 (Nov. 10) 1933.

In sixteen cases of general septic infection, Kolbe was able only once to demonstrate hematogenic metastases in both tonsils. The tonsils do not exhibit hematogenic metastases more frequenly than other organs; on the contrary, they seem to possess a certain immunity. The bacterial flora of the tonsillar crypts remains uninfluenced in septicemia unless the mouth or the pharynx is flooded with the septic bacteria through purulent metastases. The investigations show the necessity of differentiating sharply between a resorptive tonsillar disease and hematogenic metastases. EDITOR'S ABSTRACT.

Larynx

ASSOCIATED PARALYSES OF THE VOCAL CORD. H. BURGER, J. Laryng. & Otol. **49**:1 (Jan.) 1934.

Burger questions the anatomic justification for the numerous syndromes described in relation to paralysis of the vocal cord. He feels that the attempt to distinguish the syndromes of Collet and Sicard, Jackson, Vernet, Schmidt, Avellis, Tapia and Villaret, unless their diagnosis is unqualifiedly justified, confuses further a difficult subject. On the basis of a review of the anatomic relations as determined by dissections and clinical observations, he proposes four major divisions to take the place of these syndromes. Under one division, which he calls the "syndrome of the bulbar nerves," he suggests collecting the paralyses of the vago-accessory nerve of central and extramedullar origin, as well as those of neighboring nerves. For the second division he suggests the name "syndrome of the jugular foramen." Every disorder in or near the jugular foramen belongs in this group. The "syndrome of the parapharyngeal space" is his third division. It is characterized by paralysis in the province of the ninth, tenth and twelfth nerves and the cranial sympathetic nerves. The final division he calls the "vocal cord-diaphragm syndrome." This is a rare simultaneous paralysis of the tenth, phrenic and sympathetic nerves as a result of their comparative proximity.

EDITOR'S ABSTRACT.

PEDUNCULATED CARCINOMA OF THE LARYNX. L. POLEDNÁK, Monatschr. f. Ohrenh. **67**:1433 (Dec.) 1933.

Polednák describes a case of pedunculated carcinoma of the larynx. This is a rare condition of gradual onset and relatively benign course. Both biopsy and examination of the extirpated growth later showed nonspecific granulation tissue with proliferating epithelium.

EDITOR'S ABSTRACT.

EXPERIENCES IN THE TREATMENT OF LARYNGEAL TUBERCULOSIS BY THE LARYNGEAL QUARTZ LAMP OF CEMACH. G. WOTZILKA, Monatschr. f. Ohrenh. **68**:72 (Jan.) 1934.

Wotzilka treated fifty patients with laryngeal tuberculosis by direct irradiation of the larynx from the quartz mercury vapor arc lamp according to the method of Cemach. The method is technically simple and not unpleasant, and if the patients are carefully selected and the dose is prudently adjusted, it is without danger. The author generally begins with an exposure of twenty seconds and if no reaction occurs increases this by twenty seconds at a time but does not exceed one and a half minutes. He feels that there is no doubt as to the beneficial effects of this method in the treatment of laryngeal tuberculosis.

EDITOR'S ABSTRACT.

Nose

THE RELATION OF EXOPHTHALMOS TO NASAL SINUS DISEASE. RAYMOND W. HAWKINS, New York State J. Med. **33**:65 (Jan. 15) 1933.

Four types of pathologic processes in the nasal sinuses may produce exophthalmos: (1) acute or chronic infections in the frontal sinus or in one of the ethmoid cells; (2) cavernous sinus thrombosis of nasal origin; (3) benign tumors, usually mucocele or osteoma; (4) malignant disease of the ethmoid bone.

Suppuration of the ethmoid sinuses is the most common cause of inflammation of the orbit in children. In adults, the frontal sinuses are more often involved.

Two cases are reported. In one, a boy, aged 14 years, had left frontal headache and protrusion of the left eye following a cold in the head and profuse purulent discharge from the left nostril. Both the left frontal sinus and the antrum were involved. After careful irrigations the exophthalmos began to subside, and the boy recovered in ten days.

In the other, a boy of 13 years had pain over the right eye for four days before admission to the hospital; later the lids became swollen and edematous, and the next day exophthalmos developed. He had severe right frontal headache and a temperature of 103 F. The exophthalmos was marked. The right maxillary, ethmoid and frontal sinuses were involved. The right frontal sinus and the anterior ethmoid cells were opened externally. Many complications developed, including cellulitis of the scalp and osteomyelitis of the frontal and parietal bones. The exophthalmos disappeared. Later, an extradural abscess was found and drained. The child recovered.

AIKMAN, Rochester, N. Y. [AM. J. DIS. CHILD.]

OLFACTORY DISTURBANCES IN PATIENTS WITH CRANIOCEREBRAL TRAUMATISM. J. HELMSMOORTEL, JR., R. NYSSEN and R. THIENPONT, Rev. d'oto-neuro-opht. **11**:489 (July) 1933.

Anosmia and hyposmia are caused by obstruction, lesions of the olfactory mucosa, lesions of the olfactory nerve centers or pathways and hysteria. Except in the rare cases of anosmia from serious traumatism of the nasal skeleton or of the sensory epithelium and direct injury to the pathways or centers, anosmia from mechanical causes is almost always caused by cranial traumatism. According to Laemmle, traumatism of the anterior fossa causes olfactory difficulties more often than does injury to other regions of the skull. Woelk emphasized the importance of anosmia in certain types of workers: cooks, merchants of wine, tea, coffee and tobacco and perfumers.

The authors studied the sense of smell in forty-three cases of craniocerebral traumatism. Examinations should be made soon after the accident and repeated

several times, since in some cases there is regression or modification of the anosmia. Two groups of odorous substances were used, the first purely odorant and the second having a concomitant extra-olfactory action affecting the trigeminus and the sense of taste. The use of the latter group aids in determining malingering and hysteria. The respiratory and plethysmographic reactions were observed when possible in those with marked subjective olfactory troubles. An estimate was made of the degree of anosmia by observing the time elapsed between the presentation and the perception of the odors. Of the forty-three cases, there were six of complete and lasting anosmia, two of complete anosmia evolving into hyposmia, seven of partial or variable anosmia, three of olfactory disturbances caused, probably, by mental torpor, one of simulated anosmia and two of anosmia due to previously existing nasal lesions. Of the twenty-three remaining cases, probably some had presented temporary anosmia which had disappeared before the examination. In five of the six cases of complete anosmia, a fracture was present, which in three instances involved the ethmoid bone. Only one of the nine cases of less severe olfactory disturbance presented a fracture. None of the twenty-three osmatic patients presented evidence of fracture of the ethmoid bone. Olfactory disturbances from blows on the occiput were found only once. In two cases in which the olfactory troubles definitely regressed, a reduction of the period of latency was observed at each examination. The discovery of two cases of complete anosmia caused by preexisting nasal lesions emphasizes the necessity of rhinologic and roentgenologic examination of the naso-ethmoid region.

DENNIS, Colorado Springs, Colo. [ARCH. NEUROL. & PSYCHIAT.]

HEMISUDATION OF THE FACE IN PAROXYSMS EXCITED BY COLD AND APPEARING AFTER AN ENDONASAL OPERATION. H. ROGER, Y. POURSINES and J. ALLIEZ, Rev. d'oto-neuro-opht. **11**:508 (July-Aug.) 1933.

The interest in the case reported lies in the fact that the cause of the condition was an endonasal operation. In one of Worms' cases the hemisudation followed traumatism of the external nose, and in a case reported by André-Thomas and Bars it followed, after two years, the removal of nasal polyps and resection of the inferior turbinates.

A month after resection of both middle turbinates, which was accompanied by hemorrhage and tamponade of the left nostril for a week, the patient began to sweat on the left side of the face. The sweating was located on the forehead, the malar region and the temple, occasionally extending to the occipital region. While mastication brought on the paroxysm, exposure to cold was the most active excitant. The sweating was more intense in winter and varied with the weather; it disappeared when the patient was warm in bed. General examination, the Bordet-Wassermann test and ocular examination gave negative results. There was congestion in the left side of the face, and razor cuts there bled freely. The left middle meatus of the nose was blocked by a deviation of the septum. Irritation of the mucosa of the left nostril caused more lacrimation than that of the right; it also produced discrete sweating of the nasal ala and of the forehead. A subcutaneous injection of pilocarpine hydrochloride caused more sweating on the left side of the face than elsewhere. An injection of 0.25 mg. of atropine did not diminish the suboral hydrorrhea. In spite of this result, a daily dose of 1 mg. of atropine controlled the sweating for four or five hours.

Other abnormal sympathetic reactions are known. Hallion and Comte observed a patient with advanced trophic and anesthetic trouble of the hand, in whom refrigeration produced vasodilatation. André-Thomas studied two cases of lesion of the *ganglion étoilé* in which there was no vasoconstrictor reaction to cold—the temperature was even elevated. In the case reported, the nasal mucosa was the seat of the sympathetic irritation. The effect of cold on the nasal mucosa is to cause congestion and secretion; this irritated the sympathetic nerve wounded by operation, and the latter responded by a sudoral reflex.

DENNIS, Colorado Springs, Colo. [ARCH. NEUROL. & PSYCHIAT.]

THE PATHOGENESIS AND CLINICAL PICTURE OF POLYSINUSITIS WITH ORBITAL COMPLICATIONS. G. RUSSO-FRATTASI, Ann. di ottal. e clin. ocul. **61**:187 (March) 1933.

Four cases are reported. In the first the frontal and ethmoid sinuses were involved in a purulent infection. An opening in the floor of the frontal sinus communicated with the infected orbit. Death from meningitis occurred eight days after operation. In the other three cases the orbit was apparently infected from the maxillary sinus, but the ethmoid sinuses were also affected and were possibly the primary source of the infection. The ethmoid cells are considered the most commonly affected of all the sinuses and are perhaps the most common source of orbital complications.

S. R. GIFFORD. [ARCH. OPHTH.]

ANTERIOR TURBINATE BONE IN MAN. H. RICHTER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:10 (Nov. 14) 1933.

In the right nasal cavity of a man, aged 64, Richter observed a long ridge which, in his opinion, may almost with certainty be regarded as a fully developed anterior turbinate bone. This assumption is based on the following considerations: (1) the typical location of the ridge above the anterior end of the inferior concha; (2) the characteristic direction of the ridge, with the long axis slanting upward from the front to the back, corresponding to that of the nasal bone; (3) the macroscopic form of the ridge, and (4) the smooth, histologically normal mucosa covering the ridge. This anterior turbinate is not related in any way to the agger nasi. The present observation supplements the author's previous demonstration of a rudimentary nasal concha in the human fetus which corresponds to the anterior turbinate of mammals and is not related to the agger nasi.

EDITOR'S ABSTRACT.

TRANSOSSEOUS VASCULAR ANASTOMOSES BETWEEN THE MAXILLARY SINUS AND THE ORBIT IN THE HUMAN FETUS AND IN THE NEW-BORN. H. RICHTER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:89 (Nov. 24) 1933.

Richter studied serial sections of the nose (frontal sections) of human fetuses and newly born infants to verify the existence of transosseous vascular anastomoses between the maxillary sinus and the orbit. At the end of the fourth fetal month the space between the maxillary and the cartilaginous nasal capsule which divides the sinus from the orbit is filled with connective tissue. The bone is in a state of active transformation. In some osseous spaces filled with connective tissue, the mesenchyma was observed to contain blood vessels. These constitute the anlage for the later transosseous anastomoses. In the eighth month, at which time the bone constitutes the sole and permanent wall between the sinus and the orbit, the marrow spaces contain numerous blood vessels. Connections between these and the vessels in the lining of the orbit and the maxillary sinus were demonstrable in many places. In one section, in spots where the bone was especially thin, transosseous vessels could be traced from the sinus into the orbit. The author suggests that these transosseous vascular paths may play a rôle in the spread of infection from the maxillary sinus to the orbit in later life.

EDITOR'S ABSTRACT.

ETIOLOGY OF OSTEOMYELITIS OF THE SPHENOID BONE. W. HESSE, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:94 (Nov. 24) 1933.

Hesse reports seven cases of osteomyelitis of the sphenoid bone which showed that disease of the sphenoid bone and the sphenoid sinus must be considered among the causes of endocranial complications of uncertain origin. The cases also illustrated the various causes of osteomyelitis of the sphenoid bone. In three cases the osteomyelitis was caused by isolated empyema of the sphenoid sinus; in two, by extension of osteomyelitis of the petrous bone; in one, by trauma and in one by either a septic condition or an ascending inflammation of the epipharynx.

EDITOR'S ABSTRACT.

ORIGIN OF CHOLESTEATOMAS OF ACCESSORY SINUSES. CHARLOTTE ARNTZ, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:228 (Dec. 11) 1933.

In contradistinction to the common cholesteatoma of the middle ear, cholesteatomas of the accessory sinuses occur rarely. Only cholesteatoma-like bodies could be produced experimentally in the accessory cavities of rabbits and guinea-pigs, as opposed to the almost regular experimental production of cholesteatoma in the ear. This difference between man and animals can best be explained on the basis of local and constitutional properties of their tissues. Chronic irritation (with trichloracetic acid, warm tar and croton oil) of the preformed pavement epithelium of rabbits and guinea-pigs produced, it is true, proliferations of the epithelium, partly with bunglike deep hypertrophy, partly with superficial scaling, but there was no typical pseudocholesteatoma formation.

EDITOR'S ABSTRACT.

TREATMENT OF FRONTAL SINUSITIS BY EXTERNAL DRAINAGE. K. BECK, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **24**:369, 1933.

Beck believes that a satisfactory method of handling purulent frontal sinusitis is to follow a Kümmel puncture (external puncture of the frontal sinus) with the insertion of a small cannula (diameter, 1.8 mm.). Aspiration daily for two or three days, each aspiration being followed by an injection of 1:1,000 epinephrine hydrochloride or irrigation with physiologic solution of sodium chloride, usually resulted in rapid healing. Secondary infections of the bone occurred rarely, and those of the soft tissue healed readily.

EDITOR'S ABSTRACT.

INJURIES TO THE TEETH FOLLOWING OPERATION ON THE MAXILLARY SINUS. W. SCHENK, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **24**:336 (Nov.) 1933.

Schenk discusses the literature and reports the results of his investigation of the effect of surgical intervention in the maxillary sinus on the teeth in eight patients operated on by the Caldwell-Luc method. Investigations were made before and after operation. Faradic current was employed to test the vitality of the teeth. Impairment of the vitality of the teeth exclusively in the premolar region was demonstrable several days after the operation. In only one case, in which a Hinsberg operation was performed because of existing ozena, were the incisors and the canine teeth affected. A change in the vitality of the pulp does not necessarily signify that the tooth is dead. Despite the impairment of the sensitivity of the teeth, no great injury results to them from operation on the maxillary sinus, since trophic injuries of the pulp have rarely been observed.

EDITOR'S ABSTRACT.

DIFFICULTIES OF DIFFERENTIAL DIAGNOSIS IN SCHÜLLER-CHRISTIAN DISEASE. H. CLAUS, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **24**:391, 1933.

Claus describes the case of a man, aged 62, in which some of the symptoms suggested Schüller-Christian disease. A high cholesterol content of the blood gave further suggestive evidence. Tissue removed at operation from a tumor in the frontal sinus showed a lymphangiomatous carcinoma. The erroneous diagnosis of Schüller-Christian disease in this case was attributed largely to swelling of the upper eyelids and to the high blood cholesterol, though the absence of focalized osseous lesions in the skull and the absence of diabetes insipidus spoke against this symptom complex.

EDITOR'S ABSTRACT.

COMPARATIVE ANATOMY OF THE PRIMATE NOSE. H. RICHTER, Ztschr. f. Laryng., Rhin., Otol. (Teil 1: Folia oto-laryng.) **24**:438, 1933.

The basis for this study by Richter was the nose of an 18 cm. orang-utan fetus, the exact age of which could not be determined. The material was embedded in pyroxylin and cut in 20 micron serial sections which were stained by the method

of Mallory. A wax model twenty-five times the size of the original nose was made. In the orang-utan the inferior concha extends backward to the line between the nasal cavity and the nasopharyngeal opening, while in man it consists only of a curved tuberosity ending in front of the choanae. Moreover, in the orang-utan there is a fourth concha lying behind and somewhat above the third. For the most part, the nasal structure is cartilaginous. In only a few places has ossification occurred. The nasal septum is straight. Air-containing ethmoid cells such as are found in the human being are absent in the orang-utan but are represented by vesicular enlargements of the cribral pockets with narrow openings like those in the human fetus. The blood vessels of the nasal mucosa are arranged in two layers in the orang-utan, as in man.

EDITOR'S ABSTRACT.

Miscellaneous

THE LEAKING BRAIN ABSCESS. D. MCKENZIE, J. Laryng. & Otol. **48**:797 (Dec.) 1933.

McKenzie discusses the spontaneous rupture and gradual discharge of an abscess of the brain which merits the name of leaking brain abscess. He states that while symptoms may be so mitigated by the leakage that the evolution of the disease is prolonged, the progress continues to be downward and the end, though delayed, is seldom in doubt. Sooner or later the surgeon must intervene to improve the drainage. The intervention will depend on the quantity of pus discharged and on the patient's general condition and particular symptoms. Relief of headache and of pain, even when complete and lasting, is not sufficient to justify a relaxation of vigilance, for an abscess of the brain may progress painlessly to a fatal issue. In choosing a site for drainage it is not wise to ignore the selection by nature of a certain point for drainage. Leakage, wherever it occurs, leads to the formation of a sinus with more or less firm and resistant walls. That is, around the track there is an inflammatory zone shutting off the infected from the uninfected meningeal and brain tissues. Within the limits of this area the surgeon can make incisions and insert tubes without much risk of spreading the infection. The apparently out-of-the-way fistula may represent the site of origin of the abscess, and the stalk may be situated at that spot. It is probably wise to combine drainage through an outlying fistula with drainage through the apparent site of origin, whether it is the nasal sinus or the ear. Or the fistula may be selected to begin with, and if this fails to give the necessary relief, the original site may then be tried. When leakage takes place through some inaccessible region, a direct opening should be made into the abscess. Safety in the operation consists in keeping as much as possible within the confines of the inflammatory zone around the discharging sinus. If the surgeon can provide sufficient drainage for the abscess without too rashly encroaching on the adjoining meninges and brain, he has done all that can be expected. Whether or not a drainage tube or tubes should be inserted may at times be a matter for consideration. If the leaking sinus is short, its track wide and the flow of pus easy, and if there are no indications of intracranial disturbance, a tube may be safely dispensed with, but when it is necessary to enlarge the track, a tube will be indispensable to maintain its patency, since without a tube the brain matter will close in on the unresisting sinus and obliterate it.

EDITOR'S ABSTRACT.

UNSUSPECTED CHRONIC BRONCHIECTASIS FROM INHALATION OF A FRAGMENT OF BONE: AN UNUSUAL SEQUEL TO COMMINUTED FRACTURE OF THE NASAL BONES. B. S. CRAN, J. Laryng. & Otol. **48**:821 (Dec.) 1933.

In a survey of the literature Cran failed to find a record of another case in which a fragment of bone from a fracture of the nasal bones was inhaled into the air passages and caused bronchiectasis, and he did not find mention of this possible complication of fracture of the nasal bones in any of the standard textbooks on

surgery. Such a complication must be rare, for in order that the fragment may be dislodged so that it is free to be inhaled, its periosteal and mucous attachments must be completely severed; severe comminution of the bone with laceration and separation of the overlying mucous membrane and periosteum appears to be essential. Cran explains the absence in his case of any history of "something having gone the wrong way" by the period of unconsciousness which followed the accident; but it is difficult to account for the subsequent absence of symptoms, particularly as the foreign body was a sharp fragment of bone. Symptoms arising from the presence of a foreign body in the smaller bronchi may be slight, and McKenzie stated that they are apt to escape noticed. It therefore seems probable that the fragment of bone was aspirated almost immediately into the comparatively insensitive ramifications of the bronchial tree as far as its size and shape would permit and became impacted there. The temporary impairment of the protective cough reflex during the period of unconsciousness would allow rapid and unhindered aspiration past the hypersensitive larynx and trachea. One would expect to find a history of expectoration owing to the presence of such well marked bronchiectasis, but this symptom was absent and the reason for the absence at once became apparent on examination of the specimen, which showed bronchiectasis of an extremely chronic type, with a minimal degree of sepsis and scanty secretion. Metaplasia of a single layer of cubical ciliated cells into a fully differentiated squamous epithelium had occurred within eight months. EDITOR'S ABSTRACT.

THE SYMPTOMATOLOGY OF OSTEITIS DEFORMANS. H. HÜRTER, Arch. f. Ohren-, Nasen- u. Kehlkopfh. **137**:14 (Nov. 14) 1933.

Hürter reports six cases of osteitis deformans which were diagnosed incidentally to otorhinolaryngologic examination. This disease is a form of osteodystrophia fibrosa, which occurs chiefly in middle or old age and is more often seen in men than in women. Because of its insidious onset and chronic evolution, unmarked by disturbances of the general health of the patient, the disease often remains undiagnosed for years. It affects primarily the skull and the extremities. The skull was affected in all of the author's patients; the extremities, in only three. The roentgenograms in all six cases were typical, revealing severe thickening of the bone, blurring of the contours of the bone, fibrillation of the compact bone and light and dark spots, representing porous and sclerotic foci and giving the bone a spongy appearance. The roentgenograms also showed that the vertex of the skull undergoes greater change than the base of the skull. The decrease in intracranial space may cause nervous symptoms, such as headache, vertigo, scotoma and choked disk, or a decrease in hearing or vision without pathologic changes of the nerves. In five of the six cases reported, deafness of varying degree was observed, which suggests a connection between the deafness and the osseous changes.

EDITOR'S ABSTRACT.

Book Reviews

Allgemeine und spezielle chirurgische Operationslehre. Edited by Dr. Martin Kirschner, O. Professor, Direktor der chirurgischen Klinik der Universität Tübingen. **Volume III, Part I. Die Eingriffe am Ohr und an der Nase im Rachen und Kehlkopf in der Luftröhre und in den Bronchien.** By A. Lautenschläger, Berlin. **Die Eingriffe in der Speiseröhre und am Halse.** By Dr. O. Kleinschmidt, A. O. Professor, Direktor der chirurgischen Klinik der Stadt, Krankenanstalten, Wiesbaden. Price, 118 marks, unbound; 126 marks, bound. Pp. 537, with 460 illustrations. Berlin: Julius Springer, 1934.

This volume of 537 pages has an extensive index of subjects. Operations on the ear, the nose, the pharynx, the larynx, the trachea and the bronchi are described by A. Lautenschläger and those on the pharynx, the esophagus and the throat by O. Kleinschmidt. The subject treated is that of operative technic; there is no discussion of pathology or of indications for surgical intervention. Most of the illustrations are colored; they are partly schematic, but only enough so to make the operations perfectly clear and easily followed. A great many show dissections, especially of the neck.

As may be noted by the title, the field covered includes all diseases of the upper respiratory tract and the borderline conditions, such as disease of the thyroid. The general surgeon who undertakes work in these borderline cases, as well as the otolaryngologist, will find the illustrations of the dissections and operative technic a valuable guide.

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NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON LARYNGOLOGY, OTOLOGY AND RHINOLOGY

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Place: Cleveland. Time: June 7-9, 1934.

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President: Dr. John R. Page, 127 E. 62d St., New York.
Secretary: Dr. Thomas J. Harris, 104 E. 40th St., New York.
Place: Atlantic City. Time: 1934.

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* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.